creative computing

February 1980
vol. 6, no. 2
$2.00

the #1 magazine of computer applications and software

Reviews: TRS-80 Pascal, 3 Word Processing Packages

David Levy: Intelligent Computer Games

Games: Dukedom, Blackbox Dominos, Dogbite

Programs: Genealogy, Graphing, Genetics

Financial and Investment Analysis: 6 Articles

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Inside the TRS-80

Photographing Your Computer System

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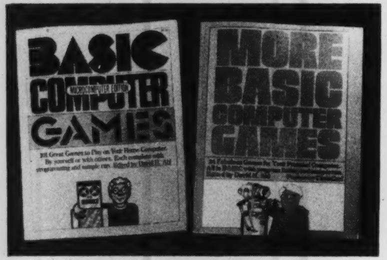

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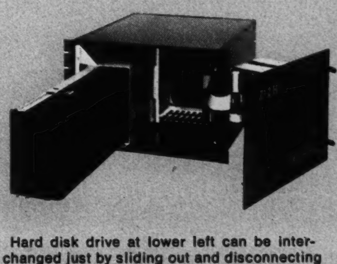

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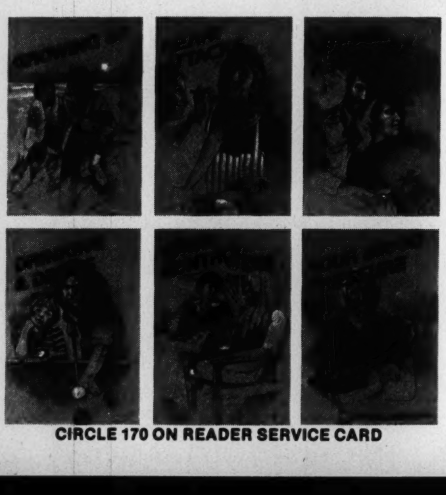

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Creative Computing magazine is published monthly by Creative Computing, P.O. Box789-M, Morristown, NJ 07960. (Editorial office: 51 Dumont Place, Morristown, NJ 07960 Phone: (201) 540-0445.)

Domestic Subscriptions: 12 issues, $15, 24 issues $28, 36 issues $40. Send subscription orders or change of address (P.O. Form 3575) to Creative computing, P.O. Box 789-M, Morristown, NJ 07960. Call 800-631-8112 toll-free (in New Jersey call 201-540-0445) to order a subscription (to be charged only to a bank card).

Second class postage paid at Morristown, New Jersey and at additional mailing offices.

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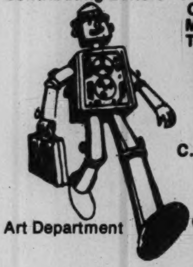

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The Cover

Gazing into the crystal ball to fortell the future is nothing new. Here is an artist's conception of what a crystal ball of the future may look like. Today, however, it seems that the personal computer may be the best tool available for forcasting, particularly with respect to financial investments and the stock market. The six articles starting on page 44 discuss several useful approaches.

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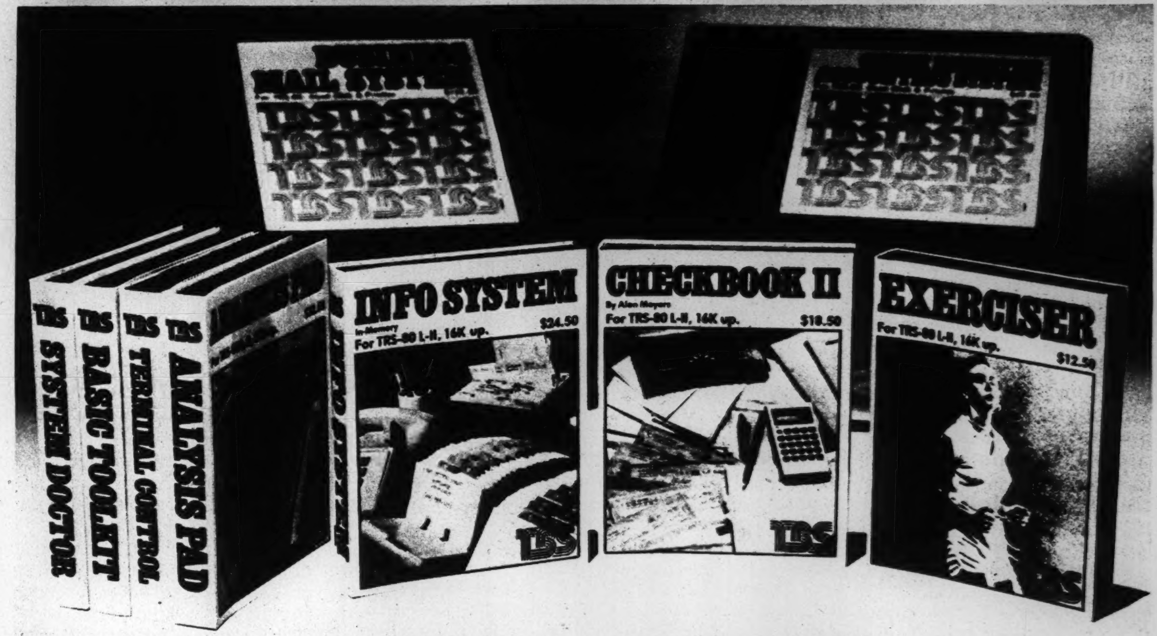

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CHECKBOOK II by Alan Meyers is the finest program of its kind yet published. With superb graphic screen displays, it does everything necessary to keep your checkbook balanced. Data is input directly into a five-column screen display with a field for alpha or numeric codes. Editing is done easily in any or all columns. **CHECKBOOK II** will accurately balance and reconcile your checkbook, handling balances up to $1,000,000. Your balance brought forward is always in memory. Outstanding checks are listed and easily saved. You can also search for an entry by any field except amount, and all checks with matching entries will be displayed and totaled. A numeric sort routine is included. Screen prints can be made to a line printer from almost any point in the program. In addition, the 32-48K version can write files to disk. This and the 16K version are included on the same tape. For $18.50, **CHECKBOOK II** is the top of the line in personal checkbook programs.

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Effective Writing

David H. Ahl

Acronyms and Capitalization

When I first got started in this crazy computer industry, about the only name where more than the first letter was capitalized was IBM and Everyone knew that the reason for that was that it stood for International Business Machines. That was in 1953 (now you know how old I am). Then in the 60's, companies went crazy trying to shorten their monikers from well-known, respectable names to "catchy" two- or three-letter acronyms. Columbia Broadcasting System abbreviated to CBS is one thing but LTV represents a horrible death for Chance Vought Aviation and Tempco just because they were bought by Jimmy Ling (Ling Tempco Vought). Today, one just has to look down the stock column listings of the *Times* or *Wall Street Journal* to see hundreds of examples of the death of perfectly good names to the anonymous realm of acronyms — TRW, AMF, CNA, CTS, NLT, MCA, MEI, GAF, FMC, etc.

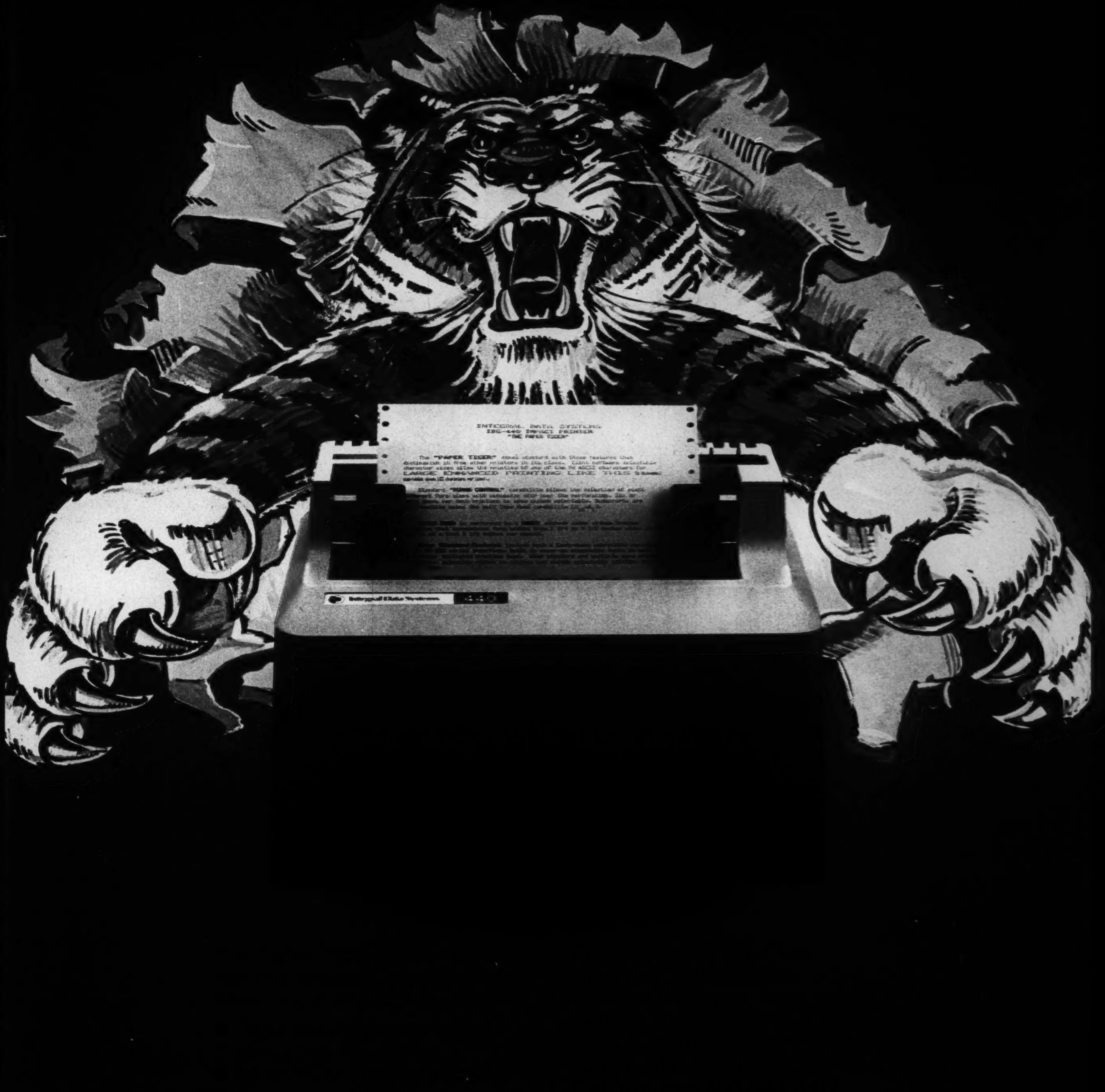
Companies like to use acronyms because then the name of their new widget is (sometimes) mentioned in capital letters in news stories and press releases. We get hundreds of press releases every week, many of which list new products in all caps because they are an acronym for something or other. Companies go to great extremes to make sure that these are capitalized in the press, Logix Industries for example, putting a period behind every letter of their educational computer kit, T.E.A.M.M.A.T.E.

What about non-proprietary acronyms? Computer languages are frequently capitalized. But why? BASIC stands for beginners all-purpose symbolic instruction code. Why not call it basic in print instead of BASIC? If the acronym represents an abbreviation of the name of an organization or whatever that would normally be capitalized, I can see some justification for capitalizing the acronym, say ANSI for American National Standards Institute, but otherwise, I'm opposed. Yielding to convention, perhaps the first letter should be capitalized to indicate that the word is an acronym, but otherwise I can see little justification for capitalizing the entire word. Capitalizing letters within an acronym representing the first letter of words from which they are derived would lead to ForTran or CoBOL (Common Business Oriented Language). Today, in print, both generally appear with the first letter capitalized, i.e., Fortran and Cobol. On the other hand, many publications and manufacturers seem insistent on printing the language BASIC in all caps; this seems unjustified to me. Pascal, because it is not an acronym, seems not to have suffered from this misuse, although, unbelievable, several magazines insist on printing it in all caps, i.e., PASCAL.

In any event, *Creative's* (arbitrary) policy is to capitalize acronyms that really stand for the names of organizations whose names are capitalized, but to only capitalize the first letter of an acronym which stands for a series of words which are not normally capitalized. In other words, computer languages are printed Basic, Pascal, Cobol, Fortran, Algol and Lisp. But we will write about ANSI standards, ASCII code, and UCSD Pascal.

An interesting story in the world of acronyms concerns Digital Equipment Corporation's family of PDP computers. PDP stands for Programmed Data Processor and was originated because the financial backers of DEC, namely ARDC (American Research and Development Corp.) did not believe that DEC could compete with IBM in making computers. Consequently, DEC's management told ARDC that they would not make computers, but rather they would make thingies called programmed data processors out of DEC's flip chips and that they were not really computers. Ha! The financial backers were fooled but not the customers who beat a path to DEC's doors to buy PDP's. Now, of course, DEC is the leading vendor of minicomputers in the world and the term PDP is well known (PDP-8, PDP-11, etc.). So, by accident, DEC created an acronym that stands out from the hodge podge of numeric designations for computers used by most other manufacturers. PDP is capitalized, by the way, because it is a trademark.

Consider some other words that are often abbreviated as acronyms (BPI or bpi for bits per inch, CPU or cpu for central processing unit, and EDP or edp for electronic data processing). Should these be capitalized? I think not, not even the first letter, because the term is generic and because it is in widespread use. Obviously, this makes the "rule" above somewhat difficult to state, much less enforce. In general, I feel that usage should dictate how acronyms are written in print. My disposition is toward the most general usage of a word — not that I am opposed to manufacturers claiming a legitimate trademark like PDP. In *Creative*, we will capitalize an entire word or acronym only if it is an actual trademark or an abbreviation for normally capitalized words. □


INTEGRAL DATA SYSTEMS
IDS-440 IMPACT PRINTER
"THE PAPER TIGER"
LARGE ENHANCED PRINTING LIKE THIS
Integral Data Systems
440

Welcome

Creative Computing Magazine
welcomes its new editor
Ted Nelson
whose influence should
begin to appear
sometime in the spring.

Effective immediately, authors should send manuscripts to Creative Computing, Attn: Editor, P.O. Box 789-M, Morristown, NJ 07960 and not to John Craig in California. Please include a SASE.

Personal Computing Society, Inc.

A new national personal computing society has been formed. The rather ambitious list of goals include facilitating the interchange of information among educators, establishing interface standards for all off-the-shelf hardware, encouraging a comparison study of all computer manufacturers, distributors and service organizations. Also planned are projects to serve the handicapped; to look into forseeable federal and local regulations; to distribute information software and equipment service facilities, clubs, and shows; and to establish a newsletter.

Membership dues are $10 for individuals or $25 for organizations. Contact Abby Gelles, Box 147, Village Station, New York, NY 10014.

Big Apple Club

The New York "Big Apple Club" is the fastest growing group of Apple II owners in the country. Our purpose is to provide the opportunity for Apple II owners to meet and share their experiences.

Club members come from all age groups and from a variety of computer and non-computer disciplines. This mix of specialties and interests benefits all members.

Meetings take place on a regular monthly basis in New York City. Although much of the club's focus is on software and applications, a new "Super Joystick" hardware project has just begun. For more information, contact Anthony Cerreta, President, 55-A Locust Ave, New Rochelle, NY 10801. (914) 636-3417.

Computer Group For Foreign Language Field

The Association for Microcomputer Programming in Languages (AMPL) has been formed as an affiliate of the American Council on the Teaching of Foreign Languages. Among its many objectives are to promote awareness and use of microcomputers in every area of research and instruction including listening comprehension, speaking, reading, writing, cultural history, media and translation. They intend to share routines, programs and knowledge about hardware and software through a newsletter to be called AMPL I/O. For further information including a copy of the first newsletter, send a stamped 9 X 12" self-addressed envelope to Wendell Hall, Dept. of Spanish and Portuguese, Brigham Young University, Provo, UT 84602.

To ATC Customers

A number of users of our Air Traffic Controller package (CS-3006) have pointed out a typographical error in the documentation which we would like to pass on to all owners of CS-3006. In the section entitled "Approach Headings" (directly beneath the aircraft instruction chart), is a sentence which reads, "The approach heading for # airport is due west, toward Fix 9. . ." This is obviously incorrect. This sentence should read, "The approach heading for # airport is due west, toward Fix 0. . ."

We regret that this error occurred and hope that it hasn't caused too much confusion. Many thanks to those individuals who pointed this error out to us.

—Creative Computing Software

Attention Apple Programmers

Two divisions of **Creative Computing** (Consulting and Software) have an immediate need for part-time, contract programmers for the Apple.

Creative Computing Software has approximately twenty programs that must be converted from other computers to the Apple. In addition, we are looking to add graphics enhancements, personalization, better instructions, and the like. Some of the programs are games but there are also statistical packages, financial packages and the like. We also have several new programs that must be written from scratch.

Creative Computing Consulting has several sizable contracts that require a large-scale programming effort. Most of these programs are for a "public" environment such as a museum or traveling exhibit so they must employ outstanding graphics and be "bullet proofed" against curious kids.

If you consider yourself an outstanding Apple programmer (TRS-80, PET and other owners need not apply), please send us a brief statement of your qualifications and a sample cassette or disk with some of your programs. Send to Eric VanHorn, Creative Computing Software, P.O. Box 789-M, Morristown, NJ 07960.

If you don't want 2500 checks, Order from ARIES

Continuous form personal and business checks are available in small quantities. ARIES offers imprinted checks in quantities of 200 and up, priced from $39.

Personal checks in personal quanities. VISA and MasterCharge accepted.

For samples and order form, write:

ARIES COMPUTER PRODUCTS
P.O. Box 7932
Eugene, OR 97401

DEALER INQUIRIES INVITED

CIRCLE 110 ON READER SERVICE CARD

We're looking for the most original use of an Apple since Adam.

What in the name of Adam do people do with Apple Computers?

You tell us.

In a thousand words or less.

If your story is original and intriguing enough, you could win a one-week all-expense paid trip for two to Hawaii. Which is the closest we could come to paradise.

Win fabulous prizes for creative writing.

To enter, drop by your nearest Apple dealer and pick up an entry blank. Fill it out. Then write an article, in 1000 words or less, describing the unusual or interesting use you've found for your Apple.

A jury of independent judges will cast the deciding vote for the grand prize: a week for two, airfare included, in Hawaii.

The judges will also choose 16 additional winners, two each from eight categories: graphics/music, entertainment, home, business, education, scientific, professional, and industrial. And each winner will choose from a long list of longed-after Apple peripherals—from Apple Disk II's to Graphics Tablets to printers. Or you can take a $250 credit towards the purchase of any Apple product.

The contest ends March 31, 1980. All winners will be notified by May 15.

Entry forms are available at your participating Apple dealer. Call 800-538-9696, (800-662-9238 in California), for the one nearest you.

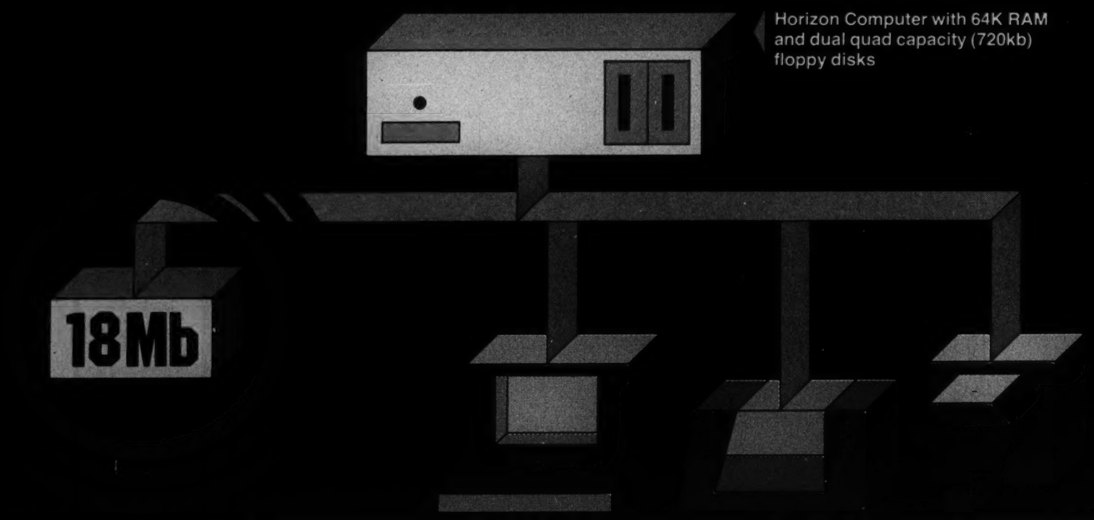
Mail the entry blank, your article and any photos to: Apple Computer, "What in the name of Adam" contest, 10260 Bandley Drive, Cupertino, CA 95014.

And may the juiciest application win.

apple computer

CIRCLE 109 ON READER SERVICE CARD

New on the North Star Horizon:
18Mb Hard Disk Drive!



Horizon Computer with 64K RAM and dual quad capacity (720kb) floppy disks

Up to four 18Mb Winchester-type hard disk drives

Display terminal

Letter-quality or dot matrix printer

Horizon I/O flexibility allows expansion to meet your needs

Unsurpassed Performance and Capacity!

North Star now gives you hard disk capacity and processing performance never before possible at such a low price! Horizon is a proven, reliable, affordable computer system with unique hardware and software. Now the Horizon's capabilities are expanded to meet your growing system requirements. In addition to hard disk performance, the Horizon has I/O versatility and an optional hardware floating point board for high-performance number crunching. The North Star large disk is a Century Data Marksman, a Winchester-type drive that holds 18 million bytes of formatted data. The North Star controller interfaces the drive(s) to the Horizon and takes full advantage of the high-performance characteristics of the drive. Our hard disk operating system implements a powerful file system as well as backup and recovery on floppy diskette.

Software Is The Key!

The Horizon's success to date has been built on the quality of its system software (BASIC, DOS, PASCAL) and the very broad range and availability of application software. This reputation continues with our new hard disk system. Existing software is upward compatible for use with the hard disk system. And, with the dramatic increase in on-line storage and speed, there will be a continually expanding library of readily available application software. For more information, see your North Star dealer!

HORIZON—HD-1
Horizon computer with 64K RAM, 2 quad capacity mini drives and one HD-18 hard disk drive **$9329**

HD-18
Additional 18Mb hard disk drive for expansion of HD-1, or your present Horizon **$4999**

SYS-1N
Complete Horizon HD-1 plus 80 x 24 display terminal and NEC Spinwriter printer **$13,239**

SYS-1A
Complete Horizon HD-1 with 80 x 24 display terminal and Anadex printer **$11,319**

NorthStar

North Star Computers Inc.
1440 Fourth St.
Berkeley, CA 94710
(415) 527-6950 TWX/Telex 910-366-7001

CIRCLE 165 ON READER SERVICE CARD

Input/ Output

Credit Due

Dear Editor:

I enjoyed reading Jon Cohen's article, *A Computer Driven Real Three-Dimensional Display* (CC, Oct 1979), and my pleasure at seeing again the Varifocal mirror drawings, adopted from my decade-old papers on this subject, was only mildly dampened by noting that Mr. Cohen had not referenced either Alan Traub as inventor of the Varifocal mirror technique or me as author of the two papers to which Mr. Cohen appears to have referred in preparation of his interesting article.

I was a bit vexed when Mr. Cohen referred to my 3-D computer-generated movie experimental system, in the context of describing his first-of-three example systems, as "... an imaginary system ..." Oh, unkind cut! Mr. Cohen got most of the technical details about this system correct, even to specifying that the image source was a specially modified 600 frame per second movie projector (it was an experimental prototype loaned to me by Wollensak Optical Products when I was at Bell Laboratories in Murray Hill, NJ), and Mr. Cohen erred only in saying it was imaginary. To call this 3-D projector system "imaginary" as well as failing to reference the paper in which it was described in detail was surely adding insult to injury, but let that pass.

However, Mr. Cohen then makes more important omissions which should be corrected. As an image source, Mr. Cohen's second example utilizes xenon flash tube illumination of slide transparencies and his third example uses a PDP-11 controlled CRT display tube. In describing work done on such systems Mr. Cohen notes only that the second system ". . . is currently being developed by [Cohen] . . . ," and the third system ". . . has been built by [Cohen] . . ." Thus, Mr. Cohen fails to mention the original work of Alan Traub, then of MITRE Corporation, who carried out essentially the same two experiments about 12 years ago. You might be interested to know that Traub's demonstrations included a computer-generated, color 3-D simulation of an air-traffic controller's radar display, complete with moving aircraft symbols over terrain maps.

I am sure these omissions were unintentional and they don't detract from the significance of the interesting work which Mr. Cohen is reporting. But the record should be clarified; hence, this letter and the following list of references which should have been included:

1. Cohen, J. *"A Computer Driven Real Three-Dimensional Display,"* Creative Computing, 5(10) Oct., 1979.
2. Traub, A. C., Applied Optics, 6, p.1085, 1967.
3. Traub, A. C., *"A New 3-Dimensional Display Technique"*, Document No. M68-4, MITRE Corp., 1968.
4. Rawson, E. G., *"3-D Computer-Generated Movies Using a Varifocal Mirror"*, Applied Optics, 7, p.1505, August 1968.
5. Rawson, E. G., *"Vibrating Varifocal Mirrors for 3-D Imaging"*, IEEE Spectrum, 6(9), p.37 September 1969.

Eric G. Rawson,
Project Leader,
Image, Transmission Technology
Xerox Corp.
Palo Alto, CA 94304

Switchless Phone Dialer

Dear Editor:

The article by Gene Christianson on the Phone Dialer (CC Nov 1979) presents a very good idea, but I would like to improve upon it if I might.

He used the normally open contacts on the relay and an SPST switch to override so the phone could be used manually. If he had used the normally closed contacts and changed Lines 82, 86 and 108, the Device would work perfectly without the need to flip any switches.

I thought you might like to pass this on to your readers (If they haven't figured it out for themselves).

Jeff Jones
1303 Park Ave #4
Omaha, NE 68105

Software Vendors

Dear Editor:

Following are some recent experiences I've had with various software vendors.

—Synergistics Software replied immediately with a nice handwritten note and a fix in response to a problem I told them about.

—I recently received a new copy of Eric's Talking Disk from Programma International with a request to mail the defective one back to them. They sent a later letter which stated that "a substantial number of users who purchase this software are not fully aware of its proper use." I can't get the demo to run which plays back my own voice on the new copy, either. I'll admit that I may not know how to use the program correctly and the only consolation I have is that I fall into the "substantial number of users" group.

—I mailed my copy of Sargon back to Hayden Books and told them about an illegal move problem. They sent back a new copy with the necessary corrections and now Sargon works great (Sargon I).

In all cases, the vendors tried to correct the problems and also stated that if I was still not satisfied a full refund would be made. Even so, I'm rather disappointed with the software industry as a whole. If I can find errors after just a few hours then why can't they find them before releasing the programs? There must have come a time, after receiving several complaints and reports of problems, that the vendors realized there were bugs in their software. I feel they should be willing to correct the ones which have been sold (and they appear to be — if you write) and, in addition, recall the copies that are sitting on store shelves. Leaving bad software on the shelves doesn't strike me as the correct way to do business.

Clarence Greathouse
14422 SE 132nd
Renton, WA 98055

I/O, cont'd...

Unhappy

Dear Editor:

Recently we purchased a Southwest Technical Products (SWTP) 6809 computer, and we have several misgivings which we would like to pass on to your readers, particularly in the area of documentation (which was nonexistent in several areas) and in the attitude taken toward the consumer.

The most serious of the aforementioned problems was that the documentation for the ROM monitor is incomplete. This is compounded by the fact that the ROM contains several bugs. In effect, this makes it almost unuseable. Proprietary information was the excuse which was given by Dan Meyer, the company president, when I called SWTP to discuss the matter. However, we are still stuck with an unuseable ROM monitor.

The second of the problems is that the CPU board contains memory mapping hardware. There is no documentation on how to use it or how it works. Mr. Meyer explained that it is not put there for use by the consumer, and that it is solely for SWTP's systems programming use. We have thereby paid for circuitry which we cannot use, and which may cause problems if activated by the ROM monitor.

Another problem is that the 6809 OP codes are not made available through SWTP. They are available from Motorola, although you'd normally expect that kind of thing to be available from the system vendor.

The attitude of Mr. Meyer, when I called to discuss the problems, seemed to be one of "this is what we offer, take it or leave it." Apparently we've already taken it (or have been taken), since they have our money, but we will obviously not be doing business in the future with SWTP. Perhaps others will be wise enough to learn from our experience.

Glen Worstell
President, Parsec Systems
2521 Lewis Drive
Sebastopol, CA 95472

Pay For Software?

Dear Editor:

In the May 1979 issue, there is an article by Randy Heuer entitled **"How To Write A User Oriented Program."** In this article, the statement "while you probably won't get rich selling your software, it is certainly nice to receive an occasional check . . ." implies that your software company will pay for programs. However, I have heard from many friends that your company doesn't pay for programs. Well, do you?

Scott Panzer
26 Lucille Lane
Dix Hills, NY 11746

Perhaps you should double-check on other things those friends tell you, Scott. Yes, we pay a royalty for the programs distributed through Sensational Software. As we have noted in several issues of Creative, our normal royalty is 10% of the list (retail) price of the tape or disk.

In addition, Creative Computing Consulting is seeking Apple programmers to do conversions and original programming on contract. —DHA

CRIBBAGE for my PET??

Dear Editor:

I received recently a letter from a sixth grader in a special computer class asking if I had a PET version of my CRIBBAGE program (May 1979). Unfortunately I am unable to help this student but if any reader has implemented CRIBBAGE on a PET perhaps they would be willing to contact:

Jonathan Fraley
McCall Donnelly Elementary School
P.O. Box 967
McCall, Idaho 83638

Thanks.

Sheppard Yarrow
6513 Farmingdale Court
Derwood, MD 20855

Questionable Advertising

Dear Editor:

I received the enclosed mailing today. It may be an honest offer but it certainly looks too much like the type of ads published by David Winthrop & World Power.

This mailing claims that "80-Microcomputing" is a brand new magazine & yet also claims to have "over 50,000 TRS-80 owners and users" reading 80 Microcomputing every month. It claims to be the only major publication for the TRS-80 without having yet published the first issue.

The charter subscription offer also promises a free book of 80 Programs, programs that "will, in fact, be published on cassette in the near future. (These are not the rejects)."

The superlatives flow on. If this is a fraud it is one that is using the U.S. Mails. If it is not a fraud then their ad writers are a little thin on credibility.

I'm not sure what should be done. I hope that you can have it checked out.

Thank you!

Howard W. Mueller
Box 17
Pocahontas, MO 63779

80 Microcomputing *will be published by 1001001, Inc. headed by Wayne Green. The company currently publishes* **Kilobaud Microcomputing** *and* **73 Magazine.**

We, too, find the description of the book "80 Programs" somewhat thin on credibility in its claim to be "the largest collection of TRS-80 programs ever published." Our book "Basic Computer Games: TRS-80 Edition" contains 101 programs and is available in Radio Shack stores all over the world. —DHA

Horizon with Pencil

Dear Editor:

I am in the process of turning my SOL in for a new Horizon so I am eagerly reading anything I can get on the Horizon. I was dreadfully disappointed in the article by Heyman in the October issue. Instead of any constructive information on getting started it was a diatribe of a book which isn't all that bad.

Why don't you get someone to write an article on how to use PENCIL with an HORIZON, perhaps adding a VDM board and an extra monitor?

Dr. Goerge L. Haller
Hound Ears Club
Blowing Rock, N.C. 28605

And, how about some techniques on converting a terminal, such as the Soroc, to a monitor? —JC

CP/M* VERSION 2 FOR TRS-80★ MODEL II NOW AVAILABLE

All Lifeboat programs require CP/M, unless otherwise stated.

Software with Manual / Manual Alone

DIGITAL RESEARCH

☐ **CP/M FLOPPY DISKETTE OPERATING SYSTEM** — Packages supplied on diskette complete with 8080 assembler, text editor, 8080 debugger and various utilities plus full documentation. CP/M available configured for most popular computer/disk systems including: North Star Single, Double or Quad density, Altair 8" disks, Helios II, Exidy Sorcerer, Vector MZ, Heath H17† or H89†, TRS-80†, iCOM 3712 and iCOM Micro Disk plus many other configurations available off the shelf. .... $145/$25
CP/M version 2 (not all formats available immediately) .... $170/$25

☐ **MP/M*** .... $300/$50

Lower prices!

☐ **MAC** — 8080 Macro Assembler. Full Intel macro definitions. Pseudo Ops include RPC, IRP, REPT, TITLE, PAGE, and MACLIB. Z80 library included. Produces Intel absolute hex output plus symbols file for use by SID (see below) .... $85/$15

☐ **SID** — 8080 symbolic debugger. Full trace, pass count and break-point program testing system with back-trace and histogram utilities. When used with MAC, provides full symbolic display of memory labels and equated values .... $70/$15

☐ **ZSID** — As above for Z80. Requires Z80 CPU $95/$25

☐ **TEX** — Text formatter to create paginated, page-numbered and justified copy from source text files, directable to disk or printer .... $70/$15

☐ **DESPOOL** — Program to permit simultaneous printing of data from disk while user executes another program from the console .... $45/$5

All Microsoft prices are discounted!

MICROSOFT

☐ **BASIC-80** — Disk Extended BASIC, ANSI compatible with long variable names, WHILE/WEND, chaining, variable length file records .... $300/$25

☐ **BASIC COMPILER** — Language compatible with BASIC-80 and 3-10 times faster execution. Produces standard Microsoft relocatable binary output. Includes Macro-80. Also linkable to FORTRAN-80 or COBOL-80 code modules .... $350/$25

☐ **FORTRAN-80** — ANSI '66 (except for COMPLEX) plus many extensions. Includes relocatable object compiler, linking loader, library with manager. Also includes MACRO-80 (see below) .... $400/$25

☐ **COBOL-80** — Level 1 ANSI '74 standard COBOL plus most of Level 2. Full sequential, relative, and indexed file support with variable file names, STRING, UNSTRING, COMPUTE, VARYING/UNTIL, EXTEND, CALL, COPY, SEARCH, 3-dimensional arrays, compound and abbreviated conditions, nested IF. Powerful interactive screen-handling extensions. Includes compatible assembler, linking loader, and relocatable library manager as described under MACRO-80. .... $625/$25

☐ **MACRO-80** — 8080/Z80 Macro Assembler. Intel and Zilog mnemonics supported. Relocatable linkable output. Loader, Library Manager and Cross Reference List utilities included .... $149/$15

☐ **XMACRO-86** — 8086 cross assembler. All Macro and utility features of MACRO-80 package. Mnemonics slightly modified from Intel ASM86. Compatibility data sheet available. .... $275/$25

☐ **EDIT-80** — Very fast random access text editor for text with or without line numbers. Global and intra-line commands supported. File compare utility included $89/$15

MICRO FOCUS

☐ **STANDARD CIS COBOL** — ANSI '74 COBOL standard compiler fully validated by U.S. Navy tests to ANSI level 1. Supports many features to level 2 including dynamic loading of COBOL modules and a full ISAM file facility. Also, program segmentation, interactive debug and powerful interactive extensions to support protected and unprotected CRT screen formatting from COBOL programs used with any dumb terminal .... $850/$50

☐ **FORMS 2** — CRT screen editor. Output is COBOL data descriptions for copying into CIS COBOL programs. Automatically creates a query and update program of indexed files using CRT protected and unprotected screen formats. No programming experience needed. Output program directly compiled by CIS COBOL (standard) .... $200/$20

☐ **HDBS** — Hierarchical Data Base System. CODASYL oriented with FILEs, SETs, RECORDs and ITEMs which are all user defined. ADD, DELETE, UPDATE, SEARCH, and TRAVERSE commands supported. SET ordering is sorted, FIFO, LIFO, next or prior. One to many set relationship supported. Read/Write protection at the FILE level. Supports FILEs which extend over multiple floppy or hard disk devices.

NEW!!

☐ **MDBS** — Micro Data Base System. Full network data base with all features of HDBS plus multi-level Read/Write protection for FILE, SET, RECORD and ITEM. Explicit representation of one to one, one to many, many to many, and many to one SET relationships. Supports multiple owner and multiple record types within SETs. HDBS files are fully compatible.

NEW!!

☐ **MDBS-DRS** — MDBS with Dynamic Restructuring System option which allows altering MDBS data bases when new ITEMs, RECORDs, or SETs are needed without changing existing data.

NEW!!

HDBS-Z80 version .... $250/$35
MDBS-Z80 version .... $750/$35
MDBS-DRS-Z80 version .... $950/$35
8080 Version available at $75. extra.

NOTE → Z80 version requires 20K RAM. 8080 version requires 24K RAM. (Memory requirements are additional to CP/M and application program.)
When ordering HDBS or MDBS please specify if the version required is for 1) Microsoft L80 i.e. FORTRAN-80, COBOL-80, BASIC COMPILER, 2) MBASIC 4. XX, or 3) BASIC-80 5.0.

Lower prices!

EIDOS SYSTEMS

☐ **KISS** — Keyed Index Sequential Search. Offers complete Multi-Keyed Index Sequential and Direct Access file management. Includes built-in utility functions for 16 or 32 bit arithmetic, string/integer conversion and string compare. Delivered as a relocatable linkable module in Microsoft format for use with FORTRAN-80 or COBOL-80, etc. .... $335/$23

☐ **KBASIC** — Microsoft Disk Extended BASIC with all KISS facilities, integrated by implementation of nine additional commands in language. Package includes KISS.REL as described above, and a sample mail list program .... $585/$45
To licensed users of Microsoft BASIC-80 (MBASIC) .... $435/$45

All Micropro prices are discounted!

MICROPRO

☐ **SUPER-SORT I** — Sort, merge, extract utility as absolute executable program or linkable module in Microsoft format. Sorts fixed or variable records with data in binary, BCD, Packed Decimal, EBCDIC, ASCII, floating, fixed point, exponential, field justified, etc. etc. Even variable number of fields per record! .... $225/$25

☐ **SUPER-SORT II** — Above available as absolute program only .... $175/$25

☐ **SUPER-SORT III** — As II without SELECT/EXCLUDE .... $125/$25

☐ **WORD-STAR** — Menu driven visual word processing system for use with standard terminals. Text formatting performed on screen. Facilities for text paginate, page number, justify, center and underscore. User can print one document while simultaneously editing a second. Edit facilities include global search and replace, read/write to other text files, block move, etc. Requires CRT terminal with addressable cursor positioning $445/$25

☐ **WORD-STAR/MAIL-MERGE** — As above with option for production mailing of personalized documents with mail list from Data-Star or NAD. .... $575/$25

NEW!!

☐ **WORD-STAR Customization Notes** — For sophisticated users who do not have one of the many standard terminal or printer configurations in the distribution version of WORD-STAR. .... NA/$100

NEW!!

☐ **WORD-MASTER** Text Editor — In one mode has superset of CP/M's ED commands including global searching and replacing, forward and backwards in file. In video mode, provides full screen editor for users with serial addressable-cursor terminal .... $125/$25

☐ **DATASTAR** — Professional forms control entry and display system for key-to-disk data capture. Menu driven with built-in learning aids. Input field verification by length, mask, attribute (i.e. uppercase, lowercase, numeric, auto dup., etc.). Built-in arithmetic capabilities using keyed data, constants and derived values. Visual feedback for ease of forms design. Files compatible with all CP/M-MP/M supported languages. Requires 32K CP/M .... $350/$35

NEW!!

☐ **CBASIC-2** Disk Extended BASIC — Non-interactive BASIC with pseudo-code compiler and runtime interpreter. Supports full file control, chaining, integer and extended precision variables, etc. .... $109/$15

☐ **PASCAL/M** — Compiler generates P code from extended language implementation of standard PASCAL. Supports overlay structure through additional procedure calls and the SEGMENT procedure type. Provides convenient string handling capability with the added variable type STRING. Untyped files allow memory image I/O. Requires 56K CP/M. .... $350/$30

NEW!!

☐ **PASCAL/Z** — Z80 native code PASCAL compiler. Produces optimized, ROMable re-entrant code. All interfacing to CP/M is through the support library. The package includes compiler, companion macro-assembler and source for the library. Requires 56K and Z80 CPU.
Version 2 Includes all of Jensen/Wirth except variant records. .... $275/$25
Version 3 Upgrade with variant records and strings expected 2/80. .... $395/$25

☐ **PASCAL/MT** — Subset of standard PASCAL. Generates ROMable 8080 machine code. Symbolic debugger included. Supports interrupt procedures and BCD arithmetic for real variables. CP/M file I/O and assembly language interface supported. Lacks Sets, Enumeration and Record data types. Manual explains BASIC to PASCAL conversion. Requires 32K .... $95/$30
Source for PASCAL/MT run time package. Requires MAC. (See under Digital Research.) $50

Structured Systems prices are discounted!

STRUCTURED SYSTEMS GROUP

☐ **GENERAL LEDGER** — Interactive and flexible system providing proof and report outputs. Customization of COA created interactively. Multiple branch accounting centers. Extensive checking performed at data entry for proof, COA correctness, etc. Journal entries may be batched prior to posting. Closing procedure automatically backs up input files. Now includes Statement of Changes in Financial Position. Requires CBASIC-2. .... $999/$25

☐ **ACCOUNTS RECEIVABLE** — Open item system with output for internal aged reports and customer-oriented statement and billing purposes. On-Line Enquiry permits information for Customer Service and Credit departments. Interface to General Ledger provided if both systems used. Requires CBASIC-2 .... $999/$25

☐ **ACCOUNTS PAYABLE** — Provides aged statements of accounts by vendor with check writing for selected invoices. Can be used alone or with General Ledger and/or with NAD. Requires CBASIC-2 $999/$25

Prices and specifications subject to change without notice.

Software with Manual / Manual Alone

☐ **INVENTORY CONTROL SYSTEM** — Performs control functions of adding and depleting stock items, adding new items and deleting old items. Tracks quantity of items on hand, on order and back-ordered. Optional hard copy audit trail is available. Reports include Master Item List, Stock Activity, Stock Valuation and Re-order List. Requires CBASIC-2 and 48K CP/M. .. $445/$25

NEW!!

☐ **ANALYST** — Customized data entry and reporting system. User specifies up to 75 data items per record. Interactive data entry, retrieval, and update facility makes information management easy. Sophisticated report generator provides customized reports using selected records with multiple level break-points for summarization. Requires CBASIC-2, 24 x 80 CRT, printer and 48K system. .... $225/$15

☐ **LETTERIGHT** — Program to create, edit and type letters or other documents. Has facilities to enter, display, delete and move text, with good video screen presentation. Designed to integrate with NAD for form letter mailings. Requires CBASIC-2 .... $179/$25

☐ **NAD** Name and Address selection system — interactive mail list creation and maintenance program with output as full reports with reference data or restricted information for mail labels. Transfer system for extraction and transfer of selected records to create new files. Requires CBASIC-2 .... $79/$20

☐ **QSORT** — Fast sort/merge program for files with fixed record length, variable field length information. Up to five ascending or descending keys. Full back-up of input files created. .... $95/$20

Graham-Dorian prices are discounted!

GRAHAM-DORIAN SOFTWARE SYSTEMS

☐ **GENERAL LEDGER** — An on-line system; no batching is required. Entries to other GRAHAM-DORIAN accounting packages are automatically posted. User establishes customized C.O.A. Provides transaction register, record of journal entries, trial balances and monthly closings. Keeps 14 month history and provides comparison of current year with previous year. Requires CBASIC-2. Supplied in source .... $495/$35

☐ **ACCOUNTS PAYABLE** — Maintains vendor list and check register. Performs cash flow analysis. Flexible — writes checks to specific vendor for certain invoices or can make partial payments. Automatically posts to GRAHAM-DORIAN general ledger or runs as stand alone system. Requires CBASIC-2. Supplied in source. .... $495/$35

☐ **ACCOUNTS RECEIVABLE** — Creates trial balance reports, prepares statements, ages accounts and records invoices. Provides complete information describing customer payment activity. Receipts can be posted to different ledger accounts. Entries automatically update GRAHAM-DORIAN general ledger or runs as stand alone system. Requires CBASIC-2. Supplied in source. .... $495/$35

☐ **PAYROLL SYSTEM** — Maintains employee master file. Computes payroll withholding for FICA, Federal and State taxes. Prints payroll register, checks, quarterly reports and W-2 forms. Can generate ad hoc reports and employee form letters with mail labels. Requires CBASIC-2. Supplied in source code. .... $495/$35

☐ **INVENTORY SYSTEM** — Captures stock levels, costs, sources, sales, ages, turnover, markup, etc. Transaction information may be entered for reporting by salesman, type of sale, date of sale, etc. Reports available both for accounting and decision making. Requires CBASIC-2. Supplied in source code. .... $495/$35

☐ **JOB COSTING** — Designed for general contractors. To be used interactively with other GRAHAM-DORIAN accounting packages for tracking and analysing expenses. User establishes customized cost categories and job phases. Permits comparison of actual versus estimated costs. Automatically updates GRAHAM-DORIAN general ledger or runs as stand alone system. Requires CBASIC-2. Supplied in source. .... $495/$35

☐ **APARTMENT MANAGEMENT SYSTEM** — Financial management system for receipts and security deposits of apartment projects. Captures data on vacancies, revenues, etc. for annual trend analysis. Daily report shows late rents, vacancy notices, vacancies, income lost through vacancies, etc. Requires CBASIC-2. Supplied in source code. .... $495/$35

☐ **CASH REGISTER** — Maintains files on daily sales. Files data by sales person and item. Tracks sales, overrings, refunds, payouts and total net deposits. Requires CBASIC-2. Supplied in source code. .... $495/$35

☐ **tiny C** — Interactive interpretive system for teaching structured programming techniques. Manual includes full source listings .... $75/$40

☐ **BDS C COMPILER** — Supports most major features of language, including Structures, Arrays, Pointers, recursive function evaluation, linkable with library to 8080 binary output. Lacks data initialization, long & float type and static & register class specifiers. Documentation includes "C" Programming Language book by Kernighan & Ritchie .... $110/$15

☐ **WHITESMITHS C COMPILER** — The ultimate in systems software tools. Produces faster code than Pascal with more extensive facilities. Conforms to the full UNIX*** Version 7 C language, described by Kernighan and Ritchie, and makes available over 75 functions for performing I/O, string manipulation and storage allocation. Linkable to Microsoft REL files. Requires 60K CP/M .... $630/$30

☐ **POLYVUE/80** — Full screen editor for any CRT with XY cursor positioning. Includes vertical and horizontal scrolling, interactive search and replace, automatic text wrap around for word processing, operations for manipulating blocks of text, and comprehensive 70 page manual. .... $135/$15

☐ **POLYTEXT/80** — Text formatter for word processing applications. Justifies and paginates source text files. Will generate form letters with custom fields and conditional processing. Support for Daisy Wheel printers includes variable pitch justification and motion optimization. .... $85/$15

☐ **ALGOL-60** — Powerful block-structured language compiler featuring economical run time dynamic allocation of memory. Very compact (24K total RAM) system implementing almost all Algol 60 report features plus many powerful extensions including string handling direct disk address I/O etc. Requires Z80 CPU .... $199/$20

Software with Manual / Manual Alone

☐ **Z80 DEVELOPMENT PACKAGE** — Consists of: (1) disk file line editor, with global inter and intra-line facilities; (2) Z80 relocating assembler, Zilog/Mostek mnemonics, conditional assembly and cross reference table capabilities; (3) linking loader producing absolute Intel hex disk file. .... $95/$20

☐ **ZDT** - Z80 Monitor Debugger to break and examine registers with standard Zilog/Mostek mnemonic disassembly displays $35 when ordered with Z80 Development Package. .... $50/$10

☐ **DISTEL** — Disk based disassembler to Intel 8080 or TDL/Xitan Z80 source code, listing and cross reference files. Intel or TDL/Xitan pseudo ops optional. Runs on 8080. .... $65/$10

☐ **DISILOG** — As DISTEL to Zilog Mostek mnemonic files. Runs on Z80 only .... $65/$10

☐ **XASM-68** — Non-macro cross-assembler with nested conditionals and full range of pseudo operations. Assembles from standard Motorola MC6800 mnemonics to Intel hex. .... $200/$25

NEW!!

☐ **XASM-65** — As XASM-68 for MOS Technology MCS6500 mnemonics .... $200/$25

NEW!!

☐ **TEXTWRITER III** — Text formatter to justify and paginate letters and other documents. Special features include insertion of text during execution from other disk files or console, permitting recipe documents to be created from linked fragments on other files. Has facilities for sorted index, table of contents and footnote insertions. Ideal for contracts, manuals, etc. Now compatible with Electric Pencil***** prepared files. .... $125/$20

☐ **POSTMASTER** — A comprehensive package for mail list maintenance. Features include keyed record extraction and label production. A form letter program is included which provides neat letters on single sheet or continuous forms. Requires CBASIC-2 .... $150/$15

☐ **WHATSIT?****** Interactive data-base system using associative tags to retrieve information by subject. Hashing and random access used for fast response. Requires CBASIC-2 .... $125/$25

☐ **XYBASIC** Interactive Process Control BASIC — Full disk BASIC features plus unique commands to handle bytes, rotate and shift, and to test and set bits. Available in Integer, Extended and ROMable versions.
Integer Disk or Integer ROMable .... $295/$25
Extended Disk or Extended ROMable .... $395/$25

☐ **SMAL/80** Structured Macro Assembled Language — Package of powerful general purpose text macro processor and SMAL structured language compiler. SMAL is an assembler language with IF-THEN-ELSE, LOOP-REPEAT-WHILE, DO-END, BEGIN-END constructs .... $75/$15

☐ **SELECTOR III-C2** — Data Base Processor to create and maintain multi Key data bases. Prints formatted, sorted reports with numerical summaries or mailing labels. Comes with sample applications, including Sales Activity, Inventory, Payables, Receivables, Check Register, and Client/Patient Appointments, etc. Requires CBASIC-2 Version 2. Supplied in source code. $295/$20

☐ **CPM/374X** — Has full range of functions to create or re-name an IBM 3741 volume, display directory information and edit the data set contents. Provides full file transfer facilities between 3741 volume data sets and CP/M files .... $195/$10

☐ **BASIC UTILITY DISK** — Consists of: (1) CRUNCH-14 – Compacting utility to reduce the size and increase the speed of programs in Microsoft Basic and TRS-80 Basic. (2) DPFUN – Double precision subroutines for computing nineteen transcendental functions including square root, natural log, log base 10, sin, arc sin, hyperbolic sin, hyperbolic arc sin, etc. Furnished in source on diskette and documentation .... $50/$35

☐ **THE STRING BIT** — Fortran character string handling. Routines to find, fill, pack, move, separate, concatenate and compare character strings. This package completely eliminates the problems associated with character string handling in FORTRAN. Supplied with source .... $45/$15

☐ **BSTAM** — Utility to link one computer to another also equipped with BSTAM. Allows file transfers at full data speed (no conversion to hex), with CRC block control check for very reliable error detection and automatic retry. We use it! It's great! Full wildcard expansions to send *.COM, etc. 9600 baud with wire, 300 baud with phone connection. Both ends need one. Standard and M versions can talk to one another. Compatible TRSDOS version also available .... $150/$5

★ ★ ★ ★ ★ ★

SUNDRIES & NOTIONS

☐ **HEAD CLEANING DISKETTE** — Cleans the drive read/write head in 30 seconds. Diskette absorbs loose oxide particles, fingerprints, and other foreign particles that might hinder the performance of the drive head. Lasts at least 3 months with daily use. Specify 5" or 8" .... $20. ea./$45. for 3

NEW!!

☐ **Flippy Disk Kit** — Template and instructions to modify single sided 5¼" diskettes for use of second side in single sided drives $12.50

☐ **FLOPPY SAVER** Protection for center holes of 5¼" floppy disks. Only 1 needed per diskette. Kit contains centering post, pressure tool, tough 7-mil mylar reinforcing rings. Installation tools and rings for 25 diskettes. $14.95
Re-orders of rings only $7.95

☐ **PASCAL USER MANUAL AND REPORT** — By Jensen and Wirth. The standard textbook on the language. Recommended for use by Pascal/Z, Pascal/M and Pascal/MT users. $8

NEW!!

☐ **THE C PROGRAMMING LANGUAGE** — By Kernighan and Ritchie. The standard textbook on the language. Recommended for use by BDS C, tiny C, and Whitesmiths C users. $12

NEW!!

★ ★ ★ ★ ★ ★

Shopping List No. 9

Everything on Shopping List #9 runs on 64K TRS-80 Model II

Software for most popular 8080/Z80 computer disk systems including ***NORTH STAR, iCOM, MICROPOLIS, DYNABYTE DB8/2 & DB8/4, EXIDY SORCERER, SD SYSTEMS, ALTAIR, VECTOR MZ, MECCA, 8" IBM, HEATH H17 & H89, HELIOS, IMSAI VDP42 & 44, REX, NYLAC, INTERTEC, VISTA V80*** *and* ***V200, TRS-80 MODEL I*** *and* ***MODEL II, ALTOS, OHIO SCIENTIFIC*** *and* ***IMS 5000*** *formats.*

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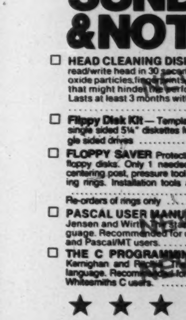
*CP/M is a trademark of Digital Research.
**Z80 is a trademark of Zilog, Inc.
***UNIX is a trademark of Bell Laboratories.
****WHATSIT? is a trademark of Computer Headware.
*****Electric Pencil is a trademark of Michael Shrayer Software.
★ TRS-80 is a trademark of Tandy Corp.

†CP/M for Heath, TRS-80 Model I and PolyMorphic 8813 are modified and must use specially compiled versions of system and applications software.

Ⓜ Modified version available for use with CP/M as implemented on Heath and TRS-80 Model I computers.

Ⓛ User license agreement for this product must be signed and returned to Lifeboat Associates before shipment may be made.

Ⓘ This product Includes/Excludes the language
Ⓧ manual recommended in Sundries and Notions above.



Orders must specify disk systems and formats: e.g. North Star single, double or quad density, IBM single or 2D/256, Altair, Helios II, Micropolis Mod I or II, 5¼" soft sector (Micro iCOM/SD Systems Dynabyte), etc.

Prices F.O.B. New York. Shipping, handling and C.O.D. charges extra.

Manual cost applicable against price of subsequent software purchase.

The sale of each proprietary software package conveys a license for use on one system only.

Lifeboat Associates, 2248 Broadway, N.Y., N.Y. 10024
(212) 580-0082 Telex: 220501 *(New number!)*

Chess Tournament Feedback

Dear Editor:

I read Stephen Kimmel's report on the "First Creative Computing Microcomputer Chess Tournament" with great interest. His observations concerning the capabilities and weaknesses of the contestants were intelligent and entertaining.

However, I am concerned over the failure of the author to mention a very serious problem which exists in at least two micro-chess machines:

THEY CHEAT! (at least sometimes)

What I mean, of course, is that bugs in their programming cause illegal moves to be generated. The two types of illegal moves which I have personally observed include:

a) Capturing a piece with an "empty" square
b) Moving a piece onto a square occupied by a piece of the same color.

These moves seem to occur when the machine is in deep trouble: facing a forced mate, say, or the unavoidable loss of a Queen.

The specific micro-chess machines in which I have seen these problems are Boris and Compu-Chess. I played several games with both machines, and was careful to follow all moves correctly. I was told by a salesperson that these bugs are known to the manufacturers (then why are the units still on sale?).

I feel that these problems should be brought to the attention of potential purchasers of these machines. After all, one can find a human opponent who cheats fairly easily, without forking over a large sum of cash for the privilege of playing him!

James F. Glass
4747 Orion Ave., Apt. C
Sherman Oaks, CA 91403

Dear Editor:

Your October 1979 issue was a great puzzler. On page 14 you published a letter from an irate purchaser of the SARGON chess program ("it makes illegal moves"). On page 72, in your article on the chess tournament, you state: "SARGON, therefore, was the computer winner. It is easily, the best program available for the home computer."

Well, who's right??!

Geoff Puterbaugh
980 Henderson #1
Sunnyvale, CA 94086

Dear Editor:

I have an amusing piece of information for Stephen Kimmel, author of "1st Creative Computing Microcomputer Chess Tournament." Try the following move sequence with Jennings' Microchess 1-5 (I used a 4K Level II TRS-80 (IQ=3)):

	Human	TRS-80
1.	KP-K4	KP-K4
2.	Q-B3	B-N4
3.	B-B4	P-Q4
4.	B×P	QBP-B3?!?
5.	Q×P Mate	

Yes, this program falls for a slight variation on the oldest trick in chess. I'm going to take Kimmel's advice and return this chess buffoon to its authors.

Thanks, Steve, for a most informative article.

Dan Goldman
711 W. Diamond Ave.
Hazleton, PA 18201

Curious note here . . . in preparing the article we played over a hundred games with the programs and machines. Many of these were to make sure that the human players knew how to operate the machines, to check the programs for gross defects, etc. In these preliminary games I heard numerous complaints of illegal moves. When I got into the recorded games . . . the games that counted . . . there were no instances of illegal moves by the computer. Later analysis of reported illegal moves by the dedicated machines, Boris, Challenger, et al showed that the computer's board in memory differed from the set up board. The implication was that the error was by the human, not the machine.

I talked to the people with Fidelity about chess computers that make mistakes. Apparently they receive dozens of units every month from irate owners complaining of illegal moves. When tested, the units function correctly and **cannot** *be forced to make improper moves. Usually.*

If you have a program or a machine that you think is making illegal moves there are a number of things you should do.

First: Make sure it is an illegal move. If you've never seen capture by en passant before, you'll scream illegal. I had one in a preliminary. The computer castled through a check. It wasn't in check before and it wasn't in check afterwards but I had an attack on one of the squares between. Human 1400 assures me that is a legal move.

Second: Check to make sure you and the computer agree on the placement of the pieces. This is obviously what is happening with Mr. Glass and his "capture with an empty square." All of the dedicated machines I've seen have the ability to verify location of the pieces. I've never heard of this happening with the full board display programs. For obvious reasons.

Third: Reset the board and the computer and see if it will do it again. The dedicated computers seem to be especially sensitive to such things as voltage surges. If the computer makes the same illegal move then your unit probably has a problem. If not . . .

Fourth: Start recording the games. The service people are going to try and duplicate the situation in which the mistake occurred. Having the full game up to the point of error is infinitely preferable to just having the board position. Further, if it is you that's making the mistake, it will reduce the errors by making you think the move through. This will be especially true if you are unfamiliar with the notation system the computer uses.

Fifth: If you are having problems with a cassette program try the program . . . and the specific game . . . on someone else's computer. It has been known to have a bad RAM drop out a few bytes with the attendant loss of program . . . or program alteration. Since Mr. Greathouse is having problems with several programs, he might be having computer problems instead. Cassettes are subject to a vast number of problems. If, after all of this, you are still having problems . . .

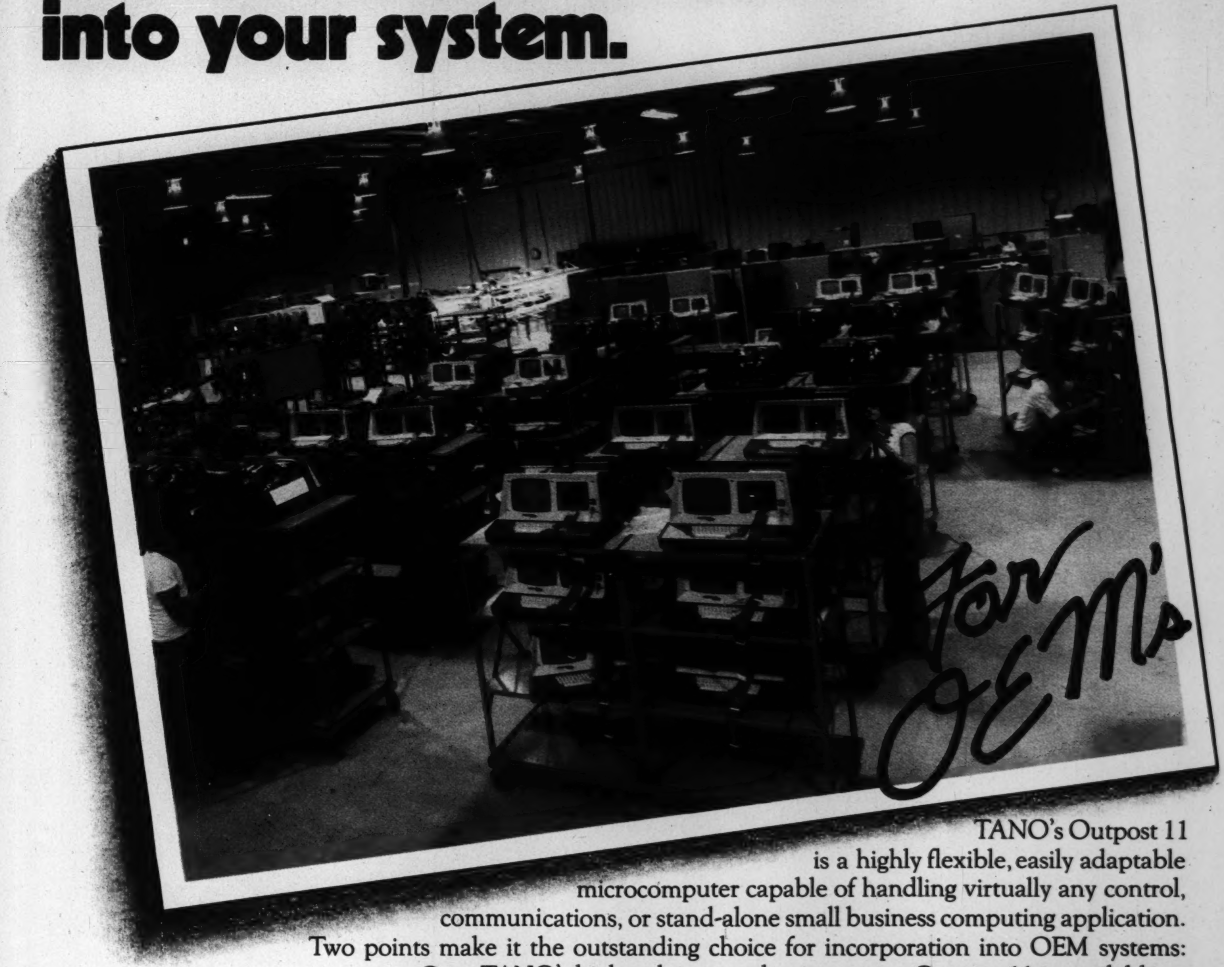
Sixth: Send it back. All of the manufacturers, Personal Software, and Hayden Publishing will replace a defective unit/tape. If Mr. Greathouse is certain that it is a fault with the program, then he should definitely send it back! Hayden is very good about replacing bad tapes. More generally, any time you get a bad program tape you should demand a replacement or your money back.

None of the programs or machines have a "Cheat" subroutine in them. When I was careful, I only got a bad move out of Microchess and that was within the limits long publicized for that program.

I've seen three or four variations on the Fool's Mate. Microchess falls for them all. It might be interesting to see who can come up with the shortest game against Microchess. Can anybody beat it in four? Three?

—Stephen Kimmel

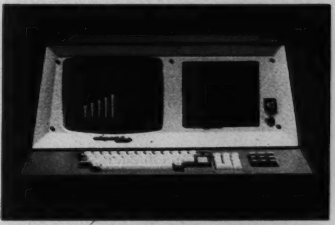
Outpost 11 has OEM written all over it. Get it into your system.



TANO's Outpost 11 is a highly flexible, easily adaptable microcomputer capable of handling virtually any control, communications, or stand-alone small business computing application.

Two points make it the outstanding choice for incorporation into OEM systems:

Cost. TANO's high-volume production means Outpost 11 is available at a most attractive price, with multi-unit discounts.



Reliability. Modular design using military/industrial grade components yields 6060-hour MTBF performance.

Add to that the finest software tools and a variety of interface options (serial line, parallel, digital acquisition or analog acquisition) and you have the most versatile microcomputer in its price range.

If you're an OEM, Outpost 11 has your name written all over it.

See your nearest TANO representative and get it into your system.

TANO Corporation, 4301 Poche Court West, New Orleans, La. 70129, (504) 254-3500.

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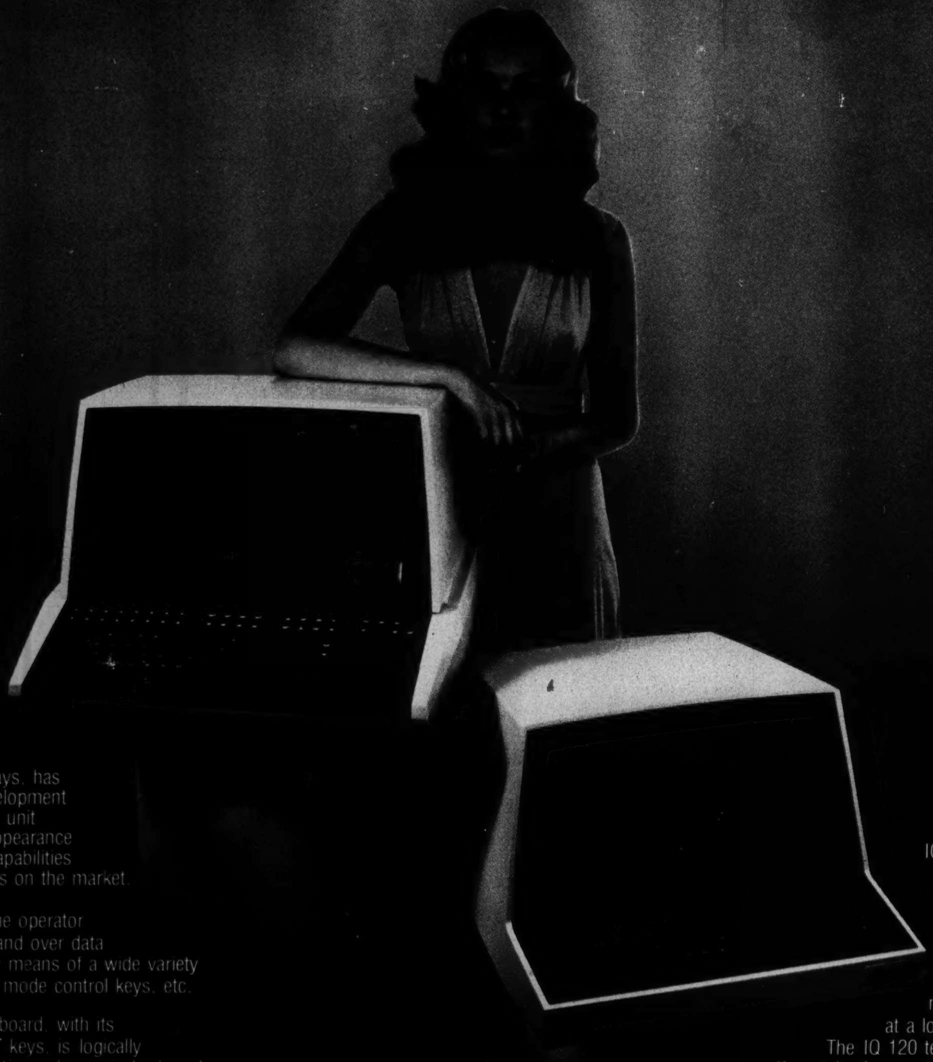
CIRCLE 195 ON READER SERVICE CARD

A Beautiful Way To Interface



SOROC's first and foremost concern, to design outstanding remote video displays, has resulted in the development of the IQ 140. This unit reflects exquisite appearance and performance capabilities unequaled by others on the market.

With the IQ 140, the operator is given full command over data being processed by means of a wide variety of edit, video, and mode control keys, etc.

The detachable keyboard, with its complement of 117 keys, is logically arranged into 6 sections plus main keyboard to aid in the overall convenience of operation. For example, a group of 8 keys for cursor control / 14 keys accommodate numeric entry / 16 special function keys allow access to 32 pre-programmed commands / 8 keys make up the extensive edit and clear section / 8 keys for video set up and mode control / and 8 keys control message and print.

Two Polling options available: 1) Polling compatible with Lear Siegler's ADM-2. 2) Polling discipline compatible with Burroughs.

The SOROC IQ 120 is the result of an industry-wide demand for a capable remote video display terminal which provides a multiple of features at a low affordable price. The IQ 120 terminal is a simple self-contained, operator / computer unit.

The IQ 120 offers such features as: 1920 character screen memory, lower case, RS232C extension, switch selectable transmission rates from 75 to 19,200 bps, cursor control, addressable cursor, erase functions and protect mode. Expansion options presently available are: block mode and hard copy capability with printer interface. The IQ 120 terminal incorporates a 12-inch, CRT formatted to display 24 lines with 80 characters per line.

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CIRCLE 190 ON READER SERVICE CARD

creative computing
WORD PROCESSING PROFILE

One view of a micro-battle

WordStar vs. Electric Pencil

Dick Lutz

Consider the nature of serious computer-based text processing:

At one level, it's really **idea processing . . .** using the speed and convenience of a microcomputer almost as though it were a dictating machine absorbing your thoughts as quickly as you can translate them from brain waves into words.

At another level, it's **efficiency**-oriented. You want to eliminate as much repetitive work as you can — never typing text a second time and easily moving changes in and out of existing material.

PENCIL emerges from this dogfight with some little triumphs of its own.

And at another, it's **presentation** processing. At this stage, the idea is to maintain control over the final "look" of the material, achieving a degree of control similar to that possible when characters are individually placed — but without giving up the advantages of speed and efficiency.

In selecting word processing software to run on a microcomputer, we have to weigh those matters, the relative importance of each, and applications at hand. With those factors in mind, I'm about to compare two programs:

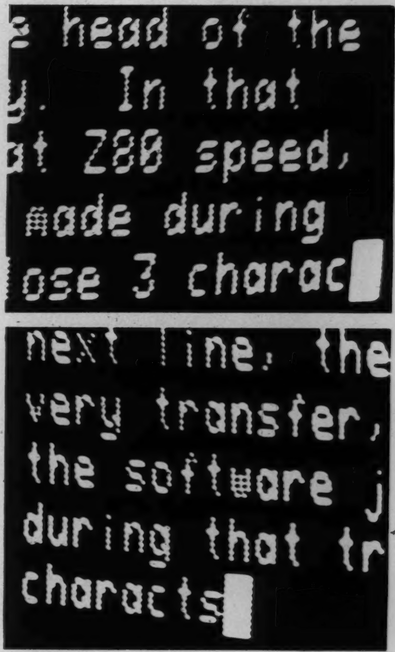
The newer **WordStar™** is the subject of hard-selling two-page ads in the magazines, claiming that ". . . delighted users have thrown away their pencils . . ." in a too obvious rap at the lower-priced competition that's been around longer. As smart as MicroPro International is in realizing that their best market for WordStar consists of micro users who've already been introduced to word processing through Michael Shrayer's **ELECTRIC PENCIL™**, it's less than accurate to suggest that the advent of WordStar should be the occasion for throwing away PENCIL software. WordStar ads have invited the comparison, so let's make it. PENCIL is our second piece of software for this evaluation.

"Unfair!" you say? True, WordStar sells in the $450-500 vicinity, a neighborhood notably more demanding of your software dollar than PENCIL's current $100-300. But PENCIL emerges from this dogfight with some little triumphs of its own, despite its more streamlined price.

In the world of flight, PENCIL would be a single-engine retractible, providing economical rapid transit. WordStar is a tactical fighter, requiring more operator sophistication and providing greater control at every level. At times, PENCIL behaves like a damp paper airplane when precision strafing is needed. But there are times when WordStar feels like a blimp when a hang glider would do the trick.

An example of PENCIL's streamlined nature has to do with its size, just 6K, compared with WordStar's 30K. When PENCIL is running, active machine memory can hold a larger document. So section accesses, searches (and replacements) are lightning fast through very large files. On the other hand, since PENCIL works only within available RAM (random access memory), it simply cannot handle a file bigger than system memory. (You can segment a document, but that means keeping track of multiple files.)

WordStar buffers text to and from disk, automatically scooping up handfuls as needed, putting parts back to make room. Because of WordStar's size, less active memory is available to contain the file being edited. So global (whole-file) search/replace missions require disk access, and therefore more time.



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PENCIL's character-drop: ELECTRIC PENCIL is supposed to "carry" words to the next line of the screen when they won't fit. But in high-speed input, characters are often lost during the transition. Here, the word "characters," too long for one line, is jumped to the next. But it comes out "characts," the "er" is lost.

This means that in a 24,000-character zone of file sizes admitted into RAM by PENCIL but too big to be in RAM with WordStar, PENCIL has the edge. In a 48K system, this applies to files roughly between 17,000 and 41,000 characters. But PENCIL's edge surfaces only in that particular size zone (which is dependent on amount of RAM in your system). In everyday uses, a few files get large enough to raise that problem, so it's not a good basis for a decision on where your text editing software dollar should go.

But there **are** good grounds on which to make a decision. The two systems **are** different, in important ways.

PENCIL is **input** oriented, while WordStar is more **output** oriented. Not that PENCIL suffers disabling disadvantages in the output arena, nor that WordStar has serious input dis-

WordStar, cont'd . . .

advantages. Each has an important place in the market.

Input is creation-related. It occurs closest to the initial assembling of vocabulary to express an idea. It may be an author or executive preparing a first draft, or a secretary typing from a dictating medium playing back, from notes prepared earlier, or from another document not yet in electronic form.

At this stage, the greatest interest is in simply getting the words into a form which will allow later editing and other manipulation. Automatic formatting is unnecessary and can even be troublesome.

This is the region of PENCIL's strength. Operating out of CP/M, to get started you simply type the word PENCIL, wait seconds, and then begin typing content onto the screen.

WordStar, by contrast, requires this sequence of steps:

Type WS . . . then wait several seconds
Select from among 5 choices by typing D, meaning you're about to edit a (new) document file.
Provide the FILENAME.TYP. Wait briefly.
Set a "Help" level to allow the emptiest sheet of paper on which to work, by typing ©J, H, 2. (© indicates a simultaneous control key depression.)
To avoid automatic justification (probably unwanted during this first-draft stage) type ©O, J.
Now, start typing text.

So if you want to use your system as you might use a typewriter — by turning to it and banging out an idea or a draft of a letter — PENCIL will do just fine, thank you, and WordStar has those few disadvantages in the form of waits, distractions and minor sluggishness. All this is quite non-fatal, but a bit annoying when you've turned to the equipment to put a fleeting thought into elusive words as rapidly as possible.

The two systems are different, in important ways.

I'm nit-picking WordStar, of course. Its several advantages far outweigh this minor distraction, but I do wish to press the point that if you don't need Word-Star's other capabilities, in this department at least, PENCIL is superior.

Similarly, as part of this input process, a writer might want to strike a quick print and go off to a corner to scribble on it. Authors will always want to see the whole before them, to make comparisons, gross cuts and exchanges among disconnected sections of text. In WordStar, to get a quick hard copy of whatever you're working on, you're required to execute this sequence of commands:

©K, D. Wait while the text is saved.
Select P (for print) for the menu of choices.
Respond with FILENAME.TYP when asked what file.
Wait while it's loaded.
Respond to 5 questions about print format.
Wait for hard copy.

That's about 20 keystrokes and three waits, one of which is the obvious wait during printing.

But in PENCIL, that's the only necessary wait. You need not even save the text file before printing it, though that's unwise for anything longer than a short note, and this sequence of commands gets the printout started:

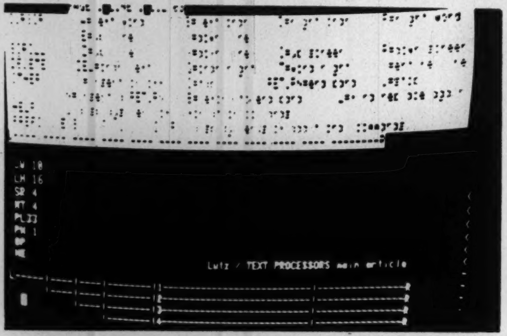
©B, to put the cursor at the head of file.
©P, to bring up the menu of print choices.
(Optionally, some format choices.)
Carriage return — to start the printing.

That's three keystrokes and no waiting except for printout.

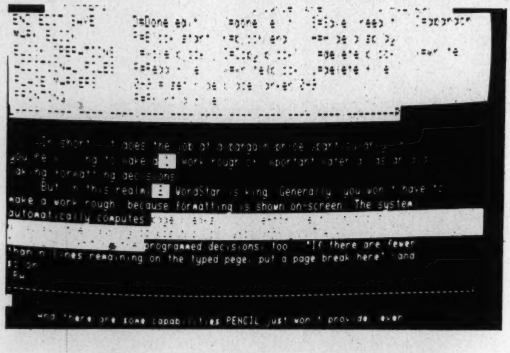
There are some other slick advantages to PENCIL for this kind of work. While composing you can check a disk contents in two keystrokes; with a few more you can check selective directory of only the kinds of files you're looking for. WordStar, by contrast, requires a return to CP/M for directory information — meaning that first you must save the file you're working on and go through much of the process described above.

In PENCIL, you can easily scroll through text, starting with a single control character, reversing direction with another. WordStar demands a three-character entry (two of them control characters) for a line-by-line scroll toward the head of text, and a similar entry to go the other way.

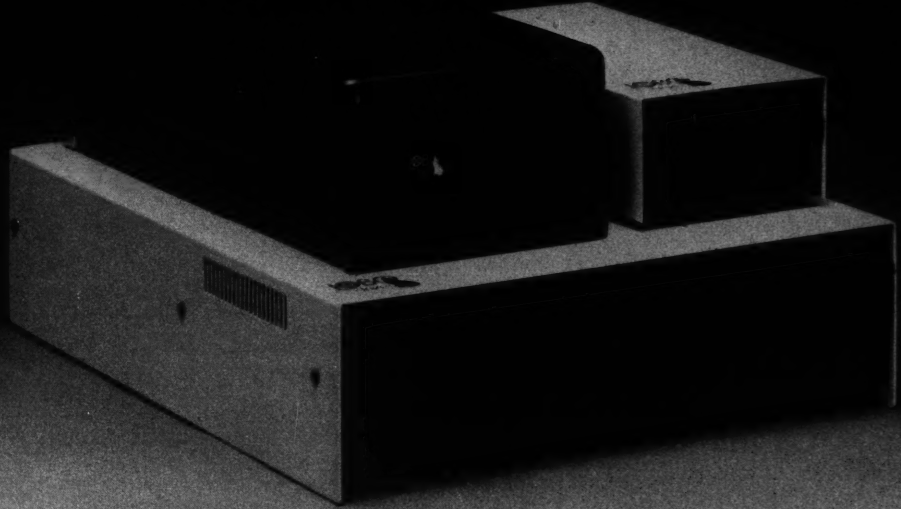
PENCIL allows printing to be stopped (type ESCAPE) for a change to be made. Printing can be resumed



WordStar's "help" system in action. The on-screen user's manual takes up space, but can be reduced to just one line by simple commands. It provides the user with a ready reference that saves the time that might ordinarily be spent looking things up in the manual. Format control characters appear at the left below the help material. The lines of hyphens are "rulers" that can be transplanted into position as page formatters: A selection can be kept at hand, and called in whenever needed.



WordStar provides in-text "place-markers" that don't print but allow you to return quickly to any of 10 pre-marked spots. They appear here as the highlighted<1> and <2>. The highlighted section of text is marked for a block move, copy, or deletion. At the top of the screen, the K prefix information shows the user what his options are after commanding control-K.



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WordStar, cont'd . . .

where terminated, though you do have to put the cursor at the pick-up spot.

So, **at its price,** PENCIL wins as an **input** device of this type. It makes your micro into an efficient supertypewriter and it behaves most like a typewriter when the job to be done is the quick drafting of text.

But with some adaptation, WordStar affords very nearly the same flexibility, and some outstanding advantages in the formatting of output . . . particularly if it's useful to you to see a line-by-line video approximation of that output before print-out begins.

WordStar's Output Orientation

An **output**-oriented system is secretarial in nature. The intent is to use form and style to facilitate the reception of the communication. Margins, indentations, outline formatting, footnotes, the placement of page breaks, headings and page numbers, justification (or not) . . . all can serve to eliminate barriers between the ideas and the reader.

Authors will always want to see the whole before them, to make comparisons, gross cuts and exchanges among disconnected sections of text.

For most purposes, PENCIL is fully adequate, providing an assortment of controls that do everything a typewriter might do and more: on an incremental printer (a Diablo, Qume or Spinwriter, essential to serious word processing at the output stage), providing boldface, variable character spacing, underlining, subtle justification through insertion of intercharacter microspaces and so on.

In short, it does the job at a bargain price, particularly if you're willing to make a work rough of important material as an aid in making formatting decisions.

But in this realm, WordStar is king. Generally, you won't have to make a work rough, because formatting is shown on-screen. The system automatically computes page breaks and line-to-line transitions and displays them during composition or reformatting. There are provisions for circumventing the programmed decisions, too: "If there are fewer than n lines remaining on the type page, put a page break here" (and so on).

And there are some capabilities PENCIL just won't provide, even with extensive manipulation. Superscripts and subscripts, for example, for things like the ™ symbol or footnotes. You can even control the amount of subscript or superscript offset in 48ths of inches. Line spacing is similarly controllable, so that what PENCIL deals with as simple single or double spacing, WordStar provides with far greater control. WordStar offers greater flexibility in intercharacter spacing, too. If you happen to need one or another of WordStar's special capabilities, you get a bonanza of other capabilities along with it.

Some of those special capabilities are on the input side. At its higher price, WordStar could hardly excuse stripped-down input.

One stunning advantage allows review or on-screen formatting of a document with minor revision, while in a neatly contrived time-share arrangement another is being printed.

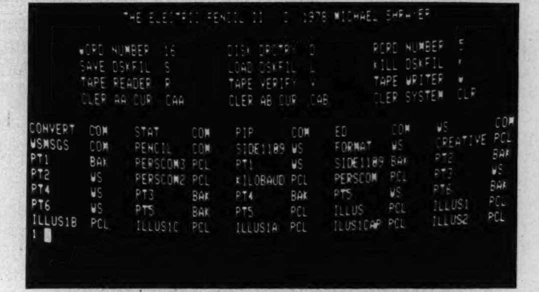
On-screen formatting is both an advantage and a disadvantage. For the output-oriented secretarial-style task, it allows a running preview of what the text will look like, and on-screen reformatting with a few keystrokes. It lets you violate margins that would otherwise be there, see charts up to screen width in final form, preview paragraph transfers shown in reverse video, spot place markers through the text with just two keystrokes and return to them with just two more.

Both systems provide for text searches, as well as text-replace capabilities. But WordStar lets you optionally disregard upper/lower case, allows item by item yes/no on search and replace operations and provides for backward search through the text to replace only in those instances occurring in text that precedes the cursor position. (PENCIL allows search (and replace) only in material past the cursor position.) It lets you mark a block of text and then write that text out to a separate file, something which can be done in PENCIL only with a series of potentially confusing manipulations.

In the realm of cursor movement — a critical concern in any system of this kind since the cursor is constant reference point for all work and must be moved about easily to make changes — WordStar offers more options. Here's a comparative checklist:

CURSOR . . .		WordStar	PENCIL
Left	one character	©S	©A
Right		©D	©S
Left	"express"	©Q©S	return
Right		©Q©D/tabs	tabs
Left	one word	©A	none
Right		©F	none
Up	one line	©E	©W
Down		©X	©Z
Top	line of screen	©QE	©Q (top left: home)
Bottom		©QX	none
Scroll toward top of text		©QQ©E	©X
Scroll toward end of text		©QQ©X	©E
Top	of text	©QR	©B
End		©QC	©N
Page forward		©C	Scroll+spacebar
Page backward		©R	
Position before last command		©QP	none
DELETIONS			
Whole line		©Y	©Y
Word right of cursor		©T	none
Line left	of cursor	©Q del	none
right		©QY	©T
Delete a marked paragraph		©QY	©U
INSERTIONS relative to cursor			
Start/stop insertion in line		©V	©F
Insert a new line		©N	©G
Move a marked paragraph		©QV	©H
Find		©QF	©V
Continue search		©L	©C
Fine/replace-with		©QA	©V

Note the utter absence of compatibility between systems, ranging from loose confusion to direct opposite assignments. Switching between systems, inadvisable, keeps the equipment in the foreground of the operator's mind, not the background where it belongs.

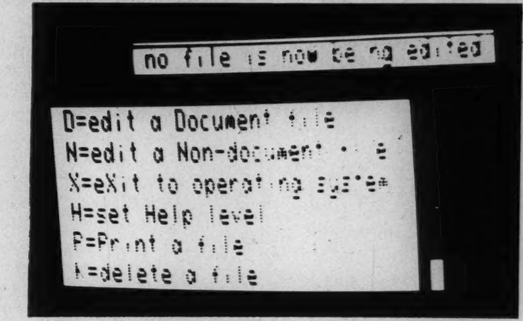


```
          THE ELECTRIC PENCIL II   © 1978 MICHAEL SHRAYER

     WORD NUMBER  16        DISK DRCTRY  D         RCRD NUMBER  5
     SAVE DSKFIL  S         LOAD DSKFIL  L         KILL DSKFIL  K
     TAPE READER  R         TAPE VERIFY  V         TAPE WRITER  W
     CLER AA CUR  CAA       CLER AB CUR  CAB       CLER SYSTEM  CLR

CONVERT  COM   STAT      COM   PIP       COM   ED        COM   WS        COM
WSMSGS   COM   PENCIL    COM   SIDE1109  WS    FORMAT    WS    CREATIVE  PCL
PT1      BAK   PERSCOM3  PCL   PT1       WS    SIDE1109  BAK   PT2       BAK
PT2      WS    PERSCOM2  PCL   KILOBAUD  PCL   PERSCOM   PCL   PT3       WS
PT4      WS    PT3       BAK   PT4       BAK   PT5       WS    PT6       BAK
PT6      WS    PT5       BAK   PT5       PCL   ILLUS     PCL   ILLUS1    PCL
ILLUS1B  PCL   ILLUS1C   PCL   ILLUS1A   PCL   ILUS1CAP  PCL   ILLUS2    PCL
1
```

A PENCIL feature WordStar doesn't offer: At any time, three keystrokes produce a directory of files on the disk — handy when you may have forgotten the title of your last temporary "save."



```
no file is now being edited

D=edit a Document file
N=edit a Non-document file
X=eXit to operating system
H=set Help level
P=Print a file
Y=delete a file
```

WordStar is "menu-driven."

Assimilability

With little ceremony and less "learning," good word processing software should make the host machine a familiar and helpful friend. The first experience is critical, because in a people-controlled environment a system that's even temporarily more trouble than help will quickly become *machina non grata*.

After that initial contact, the equipment should become as "transparent" as a familiar typewriter; even more, if possible. Interaction should quickly become — and almost always remain — a low-level mental subroutine that never crowds the priority business in the foreground of the user's mind.

If you happen to need one or another of Word Star's special capabilities, you get a bonanza of other cpabilities along with it.

PENCIL gets acquainted with finesse by being immediately and solidly responsive to the first session need: to try it out, at first, by entering some text.

Even so, I constantly advise new users to make their first use something so trivial that they won't care at all if they lose several hours of work — which is easy to do in spite of best intentions to take every precaution. On a personal letter, that kind of error is annoying; hours away from a business deadline it can lead to cardiac arrest. Unfortunately, too many come to the system because they have an immediate need, and panic is not conducive to comfortable learning.

Why? Well, an experienced typist trying for speed can lose lines of PENCIL text at first, because the carriage return key sends the cursor to the head of the current line, not the next. The usual instinctive reaction to reaching the end of a line must be suppressed, along with the paper-oriented habit of spacing across existing text to pick up the entry progress. (In video, that just erases what was there.) There are other pitfalls, too, the most serious of which is that saving text with cursor in mid-file means that not only will the first part be lost, but any previous "saves" under that title will also be lost, possibly without the user becoming aware of it. (WordStar doesn't have this fault, and automatically backs up its files, but still, work **can** be lost.

Through and after that get-acquainted session, PENCIL's manual is a strength. Back when Microsoft was still selling MBASIC with an obfuscating ragtag collection of pages that barely passed for a manual (a situation since corrected), Shrayer's PENCIL manual was a model of clarity — no doubt because in preparing it he could rely on an excellent text processing system.

Once past the early hurdle of allowing the system to automatically initiate new lines by transferring the first won't-fit word to the head of the next line, the user will encounter PENCIL's most vexing deficiency. In that very transfer, a fast typist will lose keystrikes. Even running at Z80 speed, the software just isn't fast enough to capture all the keystrikes made during that transition. So words come up incomplete. (I typically lose three characters.) Despite the ease with which corrections can be made, final material can still show up with micro-gaps in the final print-out. (As it happens, WordStar has a similar problem, less severe, under certain circumstances involving typing new text into mid-document.)

Surviving that encounter is easy. A typist newly liberated from the tension of every keystrike being a potential work-stopping error will put up with much inconvenience in exchange.

It's then that learning is facilitated by that three-keystroke ease of transition from input to printout. The self-teaching student can easily experiment with a variety of print control codes, and rapidly become expert in anticipating their effect. (That's not as true in WordStar, where that complex negotiation must precede even a short print-out.)

MicroPro has facilitated the learning process in quite another way. WordStar uses far more control codes — necessarily so, to provide far greater detail of command. So there's a prefix system in which five control characters, in five categories of activity (©0 for On-screen formatting, for

NOW: SON OF PENCIL

THE ELECTRIC PENCIL offers such slick strengths as a word processing system that it has spawned some mini-industries all by itself. The latest: MicroDaSys (of Los Angeles) has announced **PENCIL SHARPENER,** a $195 3K source file that adds a bouquet of features PENCIL users have been lusting after:

File merging to allow the automatic print-out of variable-infested form letters with variable-satisfying data files, super/subscript roll, mid-word stops for type changes (with signal bell as a reminder), use of two-color ribbon, over-strikes to get special foreign language characters, outline formatting (point numbers off to the left, text indented), and — with a NEC Spinwriter — even more. **WordStar** seems to promise the same possibilities. MicroDaSys has a SHARPENER-like **STAR BRIGHTENER** in the works.

WordStar, cont'd . . .

example), are followed by other letters to provide double-letter controls. ©Q, E moves the cursor to the top of the screen, for example. ©K, 1 sets one of 10 place-markers that the system can return to with ©Q, 1.

Since there's no way you could initially remember the vast assortment of double-letter control codes, WordStar keeps you from having to page through its excellent (and intensely detailed) manual by providing on-screen help. At first, there's a list of single key control options constantly at the top of the screen. And whenever you hit one of the five control prefixes but don't supply the rest, you see a display of options. This allows the novice user to concentrate on the creation or presentation task, knowing that help is at hand if needed.

That's more important than it may seem. The new user working from notes, checking a keyboard that has some unfamiliar gimcracks on it, and watching a screen to keep track of that new gizmo called a "cursor" can be "broken" by the additional distraction of having constantly to refer to a manual while keeping track of what it is he wanted to do in the first place.

With familiarity, the user can reduce the WordStar on-screen help (three keystrokes) to recover on-screen working space from the help area, or restore the help (three more) when memory fades.

So WordStar goes PENCIL one better by providing the on-screen help, near at hand. In spite of this, PENCIL is easier to learn, because there's less to learn. But the difference in assimilability is not so great that this should be a deciding factor.

A Criticism

Having praised the systems for neatly leaping the assimilability barrier, I must reverse field and chastise both for a tactical error they share. Each suffers from a non-fatal deficiency arising from the way people learn to type.

Typewriters quickly teach us that two keys down simultaneously is a no-no, leading to severe speed penalties like type jams in manual machines and disordered characters in electrics. The exception is the double-handed capitalization function. For a typist it becomes so automatic that no "CPU" time is spent "assigning" the shift-key job to the "free" hand.

How do these systems fall short? At the left end of the keyboard, both PENCIL and WordStar use these keys with the control key to manipulate the cursor within text (or text in relation to the cursor):

 Q W E R T
© A S D F G
   Z X C

Each system wisely uses a north-south-east-west scheme, to make directing keys easy to learn. But each **unwisely** requires simultaneous left-handed depression of both the control key (placed at the © on most keyboards) and a cursor-moving key. Hence, each system requires not only the physical coordination involved in moving the left hand to a "non-home" position, but the double keystrike as well. And since cursor movements come in bunches (three left, one up and so on) it means that a user must put the little finger on the control key and leave it there while the rest of the left hand blunders around on some not-the-usual keys. Such activity is so foreign to everything normally called for in skilled typing that it is just not efficient (even once learned). Past a certain level of skill, in fact, the more experienced a typist is, the harder it is to get this together.

The easy solution would be a left-hand control key depression, and a right-hand cursor-directing strategy, a simple adaptation of the letter capitalizing method every typist knows well. Or, alternatively, keyboards with right-hand control keys (I've never seen one). In any case, on the Diablo and Spinwriter keyboards — the keyboards most likely to be used since these systems are at their best with incremental printers, the control key is a left-hand key.

WHY A MICRO FOR WORDPROCESSING?

The reason for buying a less costly microcomputer for word processing (instead of the usual bundled hardware/software package) is that the equipment can be useful for a variety of other chores present and future. In my working environment of a television station, for example, micros (and programmable calculators) are now or one day will be in use in editorial control of program timing and editing, program scheduling, communication with viewers by direct mail, preparing semiform viewer response paragraphs, generating contract forms for talent, interactively developing and controlling budgets, scheduling shifts of union workers within contract specifications, scheduling heavy demand on videotape equipment and so on.

By meeting text editing needs with microprocessor-based equipment, a company gains computer versatility **and** the flexibility of being able to purchase and use new word processing software, as the state of the art advances.

Conclusion

What's the bottom line?

If you need a good input-oriented system in which the goal is to create files easily, and print them out without those special capabilities WordStar offers, then ELECTRIC PENCIL is your best buy for the money, especially if you don't have an incremental printer and don't anticipate buying or leasing one.

Later, if you find text processing sufficiently important to call for the purchase of a NEC Spinwriter or Diablo printer, you can easily upgrade your PENCIL and provide some enhanced output capabilities by adding MicroDaSys' PENCIL SHARPENER (see box).

What about using both? That's how this article was prepared.

On the other hand, if you have an immediate need to produce documents containing footnotes, under tight control, and you have an incremental printer, WordStar is almost surely the way to go if you can pay the dues. What more could you ask?

What about using both? That's how this article was prepared. PENCIL was my input "machine," grabbing my thoughts in draft form. Then the Michael Shrayer CONVERT utility turned those files into ASCII files which could be gobbled up by WordStar. In WordStar, then, I edited the material, reformatted it and printed it out.

But I don't recommend it, unless the operation you have in mind involves two people — a creator who uses only PENCIL and somebody else handling output (on WordStar). That's because the cursor movement keys conflict, badly in some cases, and press the "background" task of interaction with the software to the foreground level where it interferes with the main business that should be getting your brain's attention.

Whatever your decision, you'll get full value for your software dollar by purchasing **either** system. And if you do any writing, and don't yet have a microcomputer-based text processing system, either piece of software is a good reason to buy the hardware. ☐

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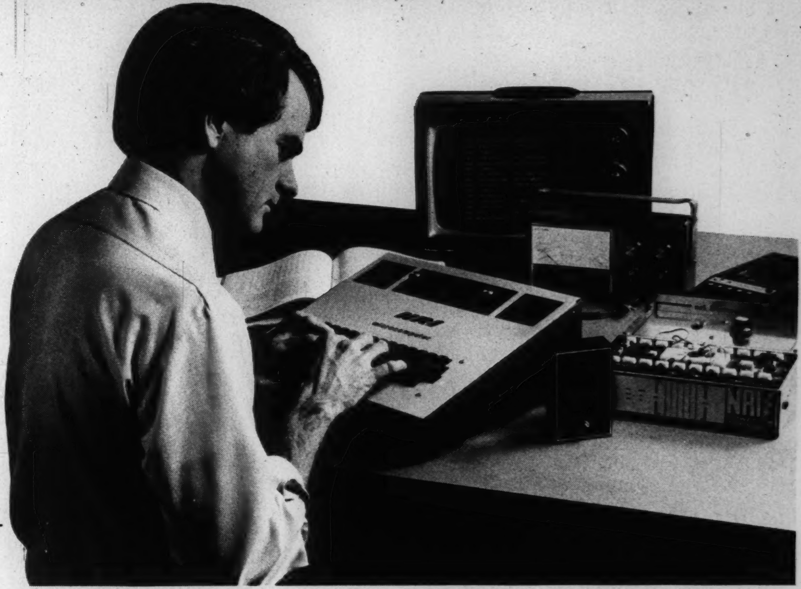

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Pascal For The TRS-80

David E. Powers

Some observations on implementing Pascal on any micro, with emphasis on the version from FMG for the TRS-80.

Three hundred people squeezed together for Peter Kugel's overview of Pascal, among the best attended seminars at the New York National Small Computer Show in August. Participants included aficionados of Cobol, Basic, Fortran, assembler and a few other languages, yet all shared interest in Pascal. Professor Kugel convinced the crowd that Pascal has emerged as a fundamental language, one serious programmers must learn. The Federal government has approved the development of ADA, a Pascal-based language, for use at all Federal computer installations. Just to stay abreast, professionals need a working knowledge of Pascal. Also, as more instructors employ it in their classrooms, more programmers will use it in their work.

Why Pascal?

What about computer hobbyists and other small system users? Among us brews a puzzling controversy over the relative merits of Basic and Pascal, yet Pascal is faster, more logical and substantially more flexible. Friends of Basic observe that it is entrenched. They argue that it is easy, but so is Pascal, and there is nothing Basic can do that Pascal cannot. The reverse is untrue. Although considerably more sophisticated than Basic, Pascal's elegant use is easier to learn, and it provides greater power for advanced programmers. Users grow with Pascal far more than they can with Basic.

Niklaus Wirth developed Pascal to teach computer novices structured programming, sometimes described as coding without "GOTO." True, structured programs rarely need "GOTO," but the characterization is an oversimplification. One writes a structured program in "top-down" fashion, solving overarching problems first, postponing attention to detail, then breaking solutions into progressively smaller problems, solved individually in "stepwise refinement." Basic is oriented to lines rather than to logical units. Programs move through algorithms vertically. Pascal is block-structured; programmers build and manipulate whole ideas at once.

The University of California at San Diego has implemented a version of Pascal suitable for microcomputers, yet considerably more powerful than a "tiny" Pascal that was not designed to meet Nicklaus Wirth's specifications, published in the **Pascal User Manual and Report.** I was delighted to learn that the FMG Corporation of Ft. Worth offered a release of UCSD Pascal for the TRS-80. It conforms well to Wirth's standards.

> **Wirth developed Pascal to teach computer novices structured programming, sometimes described as coding without "GOTO."**

```
PROGRAM FACTROOT;
CONST EPSILON=1E-5;
VAR LOWLIMIT, HIGHLIMIT, LOOPCOUNT: 1..20;
  HOLD: REAL;
FUNCTION FACTORIAL (VALUE: INTEGER): REAL;
VAR LOOPCOUNT: 1..20;
  PRODUCT: REAL;
BEGIN
  PRODUCT:=1;
  FOR LOOPCOUNT:= VALUE DOWNTO 1 DO
    PRODUCT:=PRODUCT*LOOPCOUNT;
  FACTORIAL:=PRODUCT
END; (*FACTORIAL*)

FUNCTION NEWTON (START: REAL): REAL;
VAR SQROOT: REAL;
BEGIN
  SQROOT:=1;
  REPEAT
    SQROOT:=(SQROOT+START/SQROOT)/2
  UNTIL ABS(START/SQR(SQROOT)-1)<=EPSILON;
  NEWTON:=SQROOT
END; (*NEWTON*)
BEGIN
  WRITELN('FACTORIAL AND ROOT COMPUTATION.');
  WRITELN; WRITE('ENTER LOW LIMIT (0<LOW<21)    ==> ');
  READLN (LOWLIMIT);
  WRITE ('ENTER HIGH LIMIT (1<HIGH<21) ==> ');
  READLN(HIGHLIMIT);
  FOR LOOPCOUNT:=LOWLIMIT TO HIGHLIMIT DO
    BEGIN
      HOLD:=FACTORIAL(LOOPCOUNT);
      WRITELN(LOOPCOUNT:10, HOLD:10, NEWTON(HOLD):10)
    END;
END. (*FACTROOT*)
```

Listing 1
FACTROOT, a Pascal program to find factorials and their square roots.

David E. Powers, 10 Wilben Ct., New Hyde Park, NY 11040.

Pascal, cont'd . . .

Speed is the most immediately impressive feature of Pascal on the TRS-80. A Basic interpreter must translate each Basic statement into machine language instructions every time a program runs, but a Pascal system compiles statements into object code only for the first execution, then saves the low level code (called P-code) for future runs. Pascal yields faster execution, often by a factor of four or more.

Listing 1, a Pascal program (inspired by one in Peter Grogono's **Programming in Pascal**), calculates factorials in a user-selected range from 1 to 20 and subsequently derives square roots of the factorials using Newton's iterative method (if R is an approximation of the square root of a positive number, N, then (R+(N/R))/2 is a closer approximation), within an error of 0.00001. Listing 2 performs the same task in Basic. I did not write either routine for efficiency, but deliberately multiplied number crunching to test speed. Also, I tried to prepare Basic code that would emulate the readability of Pascal, yet remain within the syntactic bounds of TRS-80 disk Basic. With a range of 1 to 20, the Basic program runs for 35 seconds. The Pascal version does the job in less than 12 seconds. Basic completes a range of 16 to 20 in 16 seconds; Pascal, in four. Imagine the consequences for long programs.

Note the Pascal program's clarity. The language is self-documenting, particularly since it allows long distinct variable names. Indentations demonstrate graphically the logic of program units. The heart of the Pascal version of "factroot" is the last third, the largest logical structure, beginning at line 23. (Pascal programs do not customarily have line numbers; the numbers in Listing 1 are for reader convenience.) It prints instructions (lines 24, 25 and 27), and reads information from the keyboard (lines 26 and 28). Next, the program enters a loop (line 29-33) which calculates factorials in the selected range (line 31) and displays the results along with the square roots of the results (line 32). The program calls the functions "Factorial" and "Newton" and passes to them the parameters "Loopcount" and "Hold."

The language is self-documenting, particularly since it allows long distinct variable names.

Function "Factorial" (line 5) yields a real result. "Loopcount" is a local variable (line 6); it is not the same "Loopcount" as in the main program. Also, the program allows "Loopcount" a value range from 1 to 20; any value outside that range will cause abnormal termination. The function declares a variable, "Product," to hold a real number. The loop (lines 10-11) runs until the factorial is calculated, then returns the value of "Product" to the calling point in the function name, "Factorial" (line 12).

"Newton" (line 14), the square root calculation sequence, accepts the value passed in the real parameter, "Start." The variable "Sqroot" is declared as real (line 15) and a repeated statement calculates the result iteratively (lines 18-19), terminating when the test in line 20 is satisfied.

The beginning of the program contains its name and a declaration of a constant, "Epsilon," the error allowed in the "Newton" function. The program allots a subrange of integers from 1 to 20 to variables "Lowlimit," "Highlimit" and "Loopcount." "Hold" is declared as a real variable.

Listings 3 and 4 (of a trivial program called "Reverse") compare relative string manipulation speed. Either version will accept a typed-in string, reverse its order, display it and repeat the process 100 times. Try Listing 4 on a TRS-80, using as an input string the English alphabet typed three times in succession. Basic will require 133 seconds to complete the task, but Pascal finishes the job in 27 seconds.

"Factroot" and "Reverse" are very simple programs, intended only to illustrate structure, readability and speed. Any Basic programmer can produce programs like "Factroot" and "Reverse" after minimal introduction to Pascal. With a little effort an experienced user of Basic should write meaningful Pascal software very readily.

Language Characteristics

Among Pascal's strengths are flexible manipulating and structuring of data. UCSD Pascal predeclares five variables types: integer (whole numbers from -32768 to +32767), real (which may have fractional parts), character, string and Boolean. Character variables compare to one-letter string literals in Basic, and strings in UCSD Pascal are similar to strings in Basic. Boolean variables are logical variables; their values may be only true or false.

Most functions and procedures native to Basic are in Pascal in some manner, although usually in improved fashion.

Pascal also permits creation of new variable types, often as subranges of other types. For example, the declaration in line 3 of Listing 1 places "Lowlimit," "Highlimit" and "Loopcount" within the subrange of integers from 1 to 20. Any attempt to assign a non-conforming value will cause a runtime error.

A declaration like

TYPE DAY = (SUNDAY, MONDAY,
TUESDAY, WEDNESDAY, THURSDAY, FRIDAY, SATURDAY);

creates a new variable type called "Day." A programmer may then declare variables of the new type, even as subranges in variable statements like

VAR WORKDAY: MONDAY . . . FRIDAY

which defines a subrange for "Workday." If the program, otherwise unaware of workers' sensitivities, should assign Saturday or Sunday to the variable, "Workday," the computer would detect the error at once.

```
10 DEFINT H,L
20 EP=1E-5
30 P1$="###########": P2$="      ##.#####[[[["
40 CLS: PRINT "FACTORIAL AND ROOT COMPUTATION."
50 PRINT: LINEINPUT "ENTER LOW LIMIT (0<LOW<21)   ==> "; LOWLIMIT$
60 LOWLIMIT=VAL(LOWLIMIT$)
70 IF LOWLIMIT<1 OR LOWLIMIT>20 THEN PRINT "ERROR.": END
80 PRINT: LINEINPUT "ENTER HIGH LIMIT (1<HIGH<21) ==> "; HIGHLIMIT$
90 HIGHLIMIT=VAL(HIGHLIMIT$)
100 IF HIGHLIMIT<1 OR HIGHLIMIT>20 THEN PRINT "ERROR.": END
110 FOR LOOPCOUNT=LOWLIMIT TO HIGHLIMIT
120 GOSUB 900
130 GOSUB 1000
140 PRINT USING P1$; LOWLIMIT;: PRINT USING P2$; RESULT; ROOT
150 NEXT
160 END
900 RESULT=1
910 FOR I%=LOOPCOUNT TO 1 STEP-1
920 RESULT=RESULT*I%
930 NEXT
940 RETURN
1000 ROOT=1
1010 ROOT=(ROOT+RESULT/ROOT)/2
1020 IF ABS(RESULT/(ROOT[2)-1))>EP THEN 1010
1030 RETURN
```

Listing 2 The Basic version of FACTROOT.

Pascal, cont'd . . .

It is also possible to declare variable types as sets or arrays or as records, single variables into which a programmer may group distinct variable types. For example, the following declarations establish a record type "Customer" which contains the customer's account number, his name, his account balance, whether he is a residential customer, and what appliances he has purchased:

```
TYPE APPLIANCE = (STOVE, DISH-
  WASHER, REFRIGERATOR,
  AIRCONDIT, COMPACTOR);
TYPE CUSTOMER =
  RECORD
    ACCOUNT: INTEGER;
    NAME: STRING;
    BALANCE: REAL;
    RESIDENTIAL: BOOLEAN;
    PURCHASES: SET OF APPLIANCE
  END;
```

Programmers may access individual fields by name or manipulate whole records in interesting ways, placing them into files, arrays, sets or other records, creating ever more complex and flexible data types.

The UCSD version corrects a glaring deficiency of standard Pascal.

Most functions and procedures native to Basic are in Pascal in some manner, although usually in improved fashion. There is even a limited GOTO. Omissions of popular features (such as default type declarations, automatic conversions, an exponentiation operator) were deliberate, to serve the need of good programming style. Many operations, functions and procedures in Pascal are new to Basic programmers. Table 1 describes some of the UCSD Pascal features. Those marked with an asterisk are UCSD extensions, not standard in all implementations.

String handling features comprise one important set of UCSD extensions. They are more powerful than the routines in TRS-80 disk Basic. Users may address or alter individual string elements in single operations because the string is a character array. For example, the fifth element of "ABCDEFG" may be referenced as ST[5], assuming that the variable name "ST" were assigned to the string. The procedure INSERT allows groups of characters to be inserted at any string position, without breaking and reconcatenating the string, as in Microsoft Basic. For instance, the Pascal statements

```
STRING 1: = 'HELLO. HOW ARE YOU
  TODAY?'
INSERT (', FRIEND', STRING1, 6)
```

will change STRING1 to read, "HELLO, FRIEND. HOW ARE YOU TODAY?" Other powerful string functions enhance interactive programs.

The UCSD version corrects a glaring deficiency of standard Pascal. Initially, Pascal did not support random access of files — a serious difficulty for disk users. UCSD Pascal includes the procedure SEEK which grants direct access to any numbered record in a file. For sequential access one may either read one record at a time or use the functions BLOCKREAD and BLOCKWRITE which transfer large segments of data to or from structured input/output devices (such as disks). UCSD enhancements to file manipulation and other I/O routines make FMG Pascal I/O operations versatile and broad, but easy for beginners who do not yet require all of the sophisticated functions but wish to grow into them.

The SEGMENT PROCEDURE, another UCSD extension, provides versatile memory allocation. Because the system software occupies a large block of memory, limited space is available for object code generated from source text. By using SEGMENT PROCEDURES the programmer may elect automatic reduction of a program into units that remain in secondary memory (e.g., disk) until they are needed. When the program requires them, the system loads them into RAM where they remain until overwritten by another segment procedure. Injudicious use of this feature will substantially decrease program speed.

The linker provides a facility whereby a Pascal program and a relocatable machine language program may be tied together.

System Operations and Support

Pascal for TRS-80 loads directly into RAM from a system disk, writing over the memory area otherwise used by TRSDOS. Consequently, programs may not use TRSDOS routines or vectors. Many of the Level II ROM routines are unusable, as they employ jumps to vectors outside the ROM.

Once loaded, UCSD Pascal presents a friendly welcoming message and requests a command. A user may select from several options: call the filer program, which itself presents a number of file manipulation and examination options; execute a program; run a program on which the user has been working; or invoke the editor, compiler, linker or assembler.

Programmers use the editor to produce any source code. It is an adequate utility with versatile editing instructions. Commands to insert, delete or change text, copy from one section of source to another, indent automatically, and justify right or left margins (but not both at once) make the editor useful and flexible. Additional advanced commands enhance it

Operation	Purpose
DIV	Integer division operator.
MOD	Integer remaindering operator.
ODD	Determines if an integer is odd.
PRED	Returns predecessor of an argument.
SUCC	Returns successor of an argument.
SIZEOF*	Returns number of bytes allocated to a variable.
CASE	Multiple branch "if" statement.
REPEAT . . UNTIL	Conditional iterative operation.
WHILE . . DO	Conditional iterative operation.
CONCAT*	Concatenates strings.
COPY*	Accesses indexed section of a string.
DELETE*	Removes characters from a string.
GOTOXY*	Addresses cursor to screen coordinate position.
IORESULT*	Advises program of error in I/O routine.
BLOCKREAD*	Reads blocks of data from a file.
BLOCKWRITE*	Writes blocks of data to a file.
SEEK*	Allows random access to a file.
SEGMENT PROCEDURE*	Retains procedure on disk to be overlaid when called.
EXTERNAL*	Declares procedure to be linked from a library.

*denotes UCSD extension

A Selection of UCSD Pascal Operations
Table 1

```
PROGRAM REVERSE;
VAR LEN, LOOP1, LOOP2: INTEGER;
  TARGET, NEWTARGET: STRING;
  CH: CHAR;
BEGIN
  WRITELN('ENTER YOUR TARGET STRING. ');
  READLN(TARGET);
  NEWTARGET:=TARGET;
  LEN:=LENGTH(TARGET);
  FOR LOOP1:=1 TO 100 DO
    BEGIN
      FOR LOOP2:=LEN DOWNTO 1 DO
        BEGIN
        CH:=TARGET[LOOP2];
        NEWTARGET[LEN-LOOP2+1]:=CH;
        END; (*LOOP2*)
      TARGET:=NEWTARGET;
      WRITELN(TARGET)
    END (*LOOP1*)
END. (*REVERSE*)
```

Listing 3
REVERSE, a Pascal program to manipulate an input string.

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Pascal, cont'd . . .

further. The absence of tab control in the TRS-80 version makes for slow columnization, especially of assembly language programs.

The compiler program translates source code from the editor into executable object code, called P-code. Source code may even contain references to other Pascal source programs, in which case the compiler will search for the necessary files and compile them into the object code, affording users a powerful facility to build libraries of external procedures and functions. Since variables within a program may be private to that program, added modules may use identical private label names without harm to the final compiled result.

During compilation the system displays its progress on the video screen. Upon discovery of a syntax error, the compiler will stop, describe the error, give its location and prompt the user to select one of three options: continued compilation (to find more errors); termination of compilation and return to the system control level; or transfer to the editor to repair the offending instruction.

Assuming a correct compilation, the user may run the program or invoke the linker which will add to the object code additional object code routines which the programmer has declared as external. Some of the Pascal I/O routines are not in the main system, but are stored in a system library. The linker finds the required routines and copies them into the otherwise incomplete code. Also, the linker permits a user to copy his own relocatable assembly language or Pascal utility programs into Pascal software as functions or procedures. In other words, the linker provides a facility whereby a Pascal program and a relocatable assembled programs may, likewise, be linked together.

The UCSD macro assembler is far better than Radio Shack's first Editor/Assembler, but not as powerful as Microsoft's Macro-80. Still, it provides a system which assembles relocatable machine code to be linked into Pascal programs, to run alone, or to be linked into other machine language software. More significantly, it is the only assembler that will work with the FMG UCSD Pascal package. Typically, assembled machine language programs or subroutines run much faster than comparable Pascal programs.

Some Fine Points and Some Problems

We have been discussing Pascal as a compiled language. Strictly speaking, UCSD Pascal for the TRS-80 is also an interpreted language. The Pascal compiler translates source code into a kind of object code called P-code which is not machine executable as is an assembly of Z-80 mnemonics. An assembly is directly runnable on a microprocessor. P-code is a special low level translation of Pascal source code, and is substantially the same either for a TRS-80 or a PDP-11. Its mnemonics look like assembly language and its object code looks like hexadecimal object code, but it needs further interpretation.

Since the Pascal P-code cannot run on a Z-80 microprocessor, the Pascal pseudo-machine prepares a final translation each time the compiled program is run. The pseudo-machine is a program in Pascal that emulates hardware when it reads individual P-code instructions. It then translates the P-code into Z-80 instructions and passes those to the microprocessor for execution.

The pseudo-machine implementation of UCSD Pascal assures standardization and system portability. To prepare new releases, all the implementor needs to vary is the pseudo-machine interpreter so that it will generate output in the microprocessor's native language. The library, compiler, linker and various other system components stay largely unchanged.

The Pascal system is not presently able to access TRSDOS files.

On the other hand, UCSD pseudo-machine implementation creates a serious problem for the user. A Z-80 treats P-code as meaningless instructions. Consequently, the TRS-80 user is unable to convert compiled Pascal programs into TRSDOS command files to be invoked from the command mode of the disk operating system. Although a minor problem for programmers dedicated to Pascal alone, those who work in several languages may find it inconvenient to be unable to access Pascal routines in those languages.

Moreover, since all Pascal files are placed on disk according to rules established in the pseudo-machine, the user may access data files and even true machine code files produced with the UCSD assembler only within the Pascal system. Conversely, the Pascal system is not presently able to access TRSDOS files.

UCSD Pascal presents some additional difficulties. The system lacks facility for double precision arithmetic. Don French, who implemented the FMG Pascal release, suggests that a revision is coming soon that will use binary coded decimal routines to permit multiple precision and long integers. FMG deliberately omitted turtlegraphics from the system. Turtlegraphics is a line drawing facility, for which the TRS-80 graphics are much too coarse. Substitute graphics instructions would be a constructive addition to future revisions of FMG UCSD Pascal.

```
10 CLEAR 500
20 DEFSTR T
30 PRINT "ENTER YOUR TARGET STRING. "
40 LINEINPUT TARGT
50 FOR I1%=1 TO 100
60 T2ARGT=""
70 FOR I2%=LEN(TARGT) TO 1 STEP-1
80 T2ARGT=T2ARGT+MID$(TARGT, I2%, 1)
90 NEXT I2%
100 TARGT=T2ARGT
110 PRINT TARGT
120 NEXT I1%
```

Listing 4
The Basic version of REVERSE.

A committee prepared the users' manual, published for UCSD by its Institute for Information Systems. Organized poorly, it mercilessly sends the reader leapfrogging through text to refine comprehension of any given point. We can forgive the style, but too much expense was spared on typography and layout. Although the authors did not intend the manual as a tutorial, it does not serve well as a reference, even to its own operating system.

The FMG release of UCSD Pascal for TRS-80 requires an environment with 48K of user RAM and two disk drives. It is an excellent language package, a fine means to learn structured programming and a versatile system for the hobbyist, business user or home computer enthusiast. Its minor deficiencies are overwhelmed by its strengths and, consequently should become a microcomputer standard. □

The FMG/UCSD Pascal system is available from FMG Corporation, PO Box 16020 - B9, Fort Worth, TX 76133 for $150 (or $100 without Macro Assembler, linker and library).

Bibliography

Kenneth L. Bowles. **Microcomputer Problem Solving Using Pascal.** New York: Springer-Verlag. 1977. — Although limited in scope, this text is geared specifically to UCSD Pascal and to small computers.

Peter Grogono. **Programming in Pascal.** Reading, MA: Addison-Wesley Publishing Co., Inc. 1979. — Excellent tutorial, covering all features of standard Pascal. Superb bibliography.

Kathleen Jensen and Niklaus Wirth. **Pascal User Manual and Report, Second Edition.** New York: Springer-Verlag. 1979. — The language standard. A must for the serious Pascal user.

UCSD Pascal System II.0 User's Manual. La Jolla, CA: Institute for Information Systems. 1979 — The system manual. Whatever its deficiencies, it is required.

Niklaus Wirth. **Systematic Programming: An Introduction.** Englewood Cliffs, NJ: Prentice-Hall, Inc. 1973. — Discusses structured programming for ALGOL 60 and Pascal.

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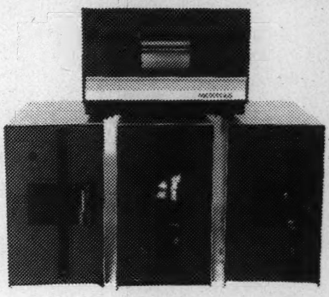

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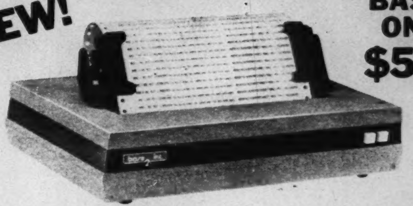

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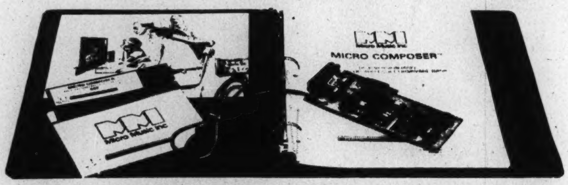


Micro Composer comes with a card for the Apple, software on cassette or disk and loose leaf instruction manual.

Introduction

Micro Composer is a music system for the Apple II. The package contains a hardware music card, software on either cassette or disk, and an instruction manual. Suggested retail price is $220. Further information is available from the manufacturer, Micro Music, Inc., 309 W. Beaufort, Normal, IL 61761. Telephone (309) 452-6991.

Micro composer allows one to compose and play up to four simultaneous voices; program the pitch, rhythm and timbre of the music; specify one of seven pre-programmed tone colors for each voice or make up a new one; save and recover music from either tape or disk; and play music using the built-in amplifier circuit. The music being played or text material may be displayed on the screen during playback.

Using the System

When Micro Composer arrived, it was barely out of the postman's hands before we ripped open the box, plugged it in to our Apple and fired it up. In the front of the manual are two pages, one for installation of Micro Composer and the other describing how to run a demonstration. Hence, one can play music immediately without having to wade through pages of instructions and hours of tedious music entry. The first instruction page carries a large notice, "Before you do anything, please read this!!!!" This would be a good policy for any manufacturer to follow, but is especially welcome with a product such as this.

The manual is 28 pages long; the first 7 pages are devoted to several examples of playing, editing and composing music and are designed for the user to enter on his or her system. The next 12 pages describe usage of the system, its functions and commands. The remaining 8 pages contain a technical description of the system. The manual is printed on heavy card stock and is bound in a three-ring binder hence it should last through many hours of flipping pages to find out how this or that is done.

Music is entered using a simple alphanumeric coding scheme. It requires three characters to define most notes--duration, note and octave. Some examples of note coding are:

ER	Eighth Rest
QF3	Quarter note F in 3rd octave
HC4	Half note C in 4th octave
SBF3	Sixteenth note B-flat in 3rd octave
.HG1	Dotted half note G in 1st octave

Music Composer has a range of four octaves. Middle C is the first note in Octave 3. Note durations range from a thirty-second note to a whole note. Any note may be dotted except a sixteenth or thirty-second.

The first music we chose to enter was a simple piano arrangement of "The Stars and Stripes Forever." We were going along famously until the fourth measure which had a whole note tied to a half note in the next measure. Unfortunately, Micro Composer does not allow for tied notes. End of a measure—end of a note. Hence, the user is faced with either putting in a second note (untied) or a rest. In this piece, at least, rests tended to sound better.

The next piece we chose to enter was the "Triumphal March" from Aida. Here we ran into trouble in the second measure. It had a triplet, another feature not provided for in Micro Composer. We don't see any easy way around this problem; we tried an eighth and two sixteenth notes and also three sixteenth notes and a rest but neither was really satisfactory.

As mentioned earlier, Micro Composer allows for up to four polyphonic voices. In a multiple voice composition, all voices must be entered at once. In other words, one enters a chord. We had grown accustomed to entering one entire voice, or part, on the ALF system and then adding additional parts, one at a time. Perhaps it is habit, but we find the ALF approach more "natural" and easier to use. On the other hand, with Micro Composer, one hears an entire chord and can make changes immediately.

However, making changes (editing) is not one of the strong points of the system. Although the manual thoroughly describes the editing

Micro Music, cont'd . . .

process, we found it awkward and time-consuming to use. To edit a note, one must start at the beginning of the piece, display the notes on the screen and "walk" through the piece until the error is found. Edit mode is then entered. After typing in the value of the erroneous "set" (or chord), new pitch codes must then be entered for every note in that set. In a four-voice composition, for example, to change or correct one erroneous note would require a minimum of 17 keystrokes and possibly many more. Another limitation of the editor is the inability to add a note or notes that might have been overlooked earlier in the entry process. Once, having entered a fairly long piece, we found, much to our dismay, that two measures toward the beginning were identical and we had only entered one of them. Micro Composer unfortunately would not let us insert the missing notes. Two hours of music entry down the drain. From then on we become somewhat paranoid about double and triple checking every entry before pressing return.

Another difference between Micro Composer and the ALF system is the treatment of the key signature and accidentals. With the ALF system, if a piece is in the key of E flat (3 flats), one enters 3F and the system automatically assigns a flat to the required notes. Also, an accidental assigned to one note in a measure automatically applies to other of the same note until the end of the measure. In the Micro Composer system, every note that is a sharp or flat must be specified separately. The key signature is not even specified. Also, accidentals do not carry over to other notes in the measure. This approach may be acceptable, and even desirable, when learning to read music. On the other hand, if one is not learning, this method is very time-consuming when entering music, for example, in the key of E major (4 sharps) or B flat minor (5 flats).

Playing Music

Micro Composer has a timbre command through which any one of seven timbres may be assigned to any voice. Timbres include:

1. Low string sound (bass voice only)
2. Wind-flute sound
3. Horn-brass sound
4. Bassoon-oboe sound
5. Clarinet choir sound
6. Electronic organ sound
7. Funky oboe

It's probably personal preference, but we found ourselves coming back to timbres 3, 4 and 5 most often. After setting tempo with a paddle, one may then elect to play or display-and-play. The display mode uses Apple high resolution graphics and displays all the notes being played on the bass and treble staffs. The notes progress from right to left across the screen. Although we have not used it with children learning music, this would appear to be a valuable feature. Unfortunately, music played in the display mode tends to sound somewhat staccato since with the appearance of each new note the computer must interrupt the note generation to refresh the display. In general, this is not a serious flaw although we don't advise playing music which has sixteenth or thirty-second notes in one voice against whole notes in the other voices--in the display mode the entire piece would sound like it consisted of the shorter notes.

The amplifier circuit on the board provides adequate volume for most rooms. However, if you're looking to use the system in an auditorium or noisy environment, you'll want to feed it through an external amplifier. The output signal is monophonic, a curious anachronism in a modern computer music synthesis system. We're not sure whether a second board could be added for stereo, but it doesn't seem so.

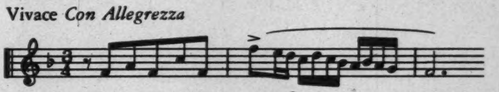
In summary

As technology rockets ahead, so do people's expectations. In the case of music synthesis systems, Hal Chamberlin's Micro Composer would have been hailed as a breakthrough just 18 months ago compared with the Solid State Music, Newtech, Software Technology and similar boards. However, Phil Tubb's ALF board for the Apple set some high standards in ease of music entry, stereo output and overall flexibility, if not in documentation (although we understand that a new ALF manual is due out shortly).

2.3 COMPOSING

2.3.1. Let's see how to enter a single melody into the computer:

This is the motive from the Bach Two-Part Invention in F major.



??VOICES = 1 (R)	Set up the COMPOSER for just 1 voice.
??COMPOSE ?0 (R)	Now, we need to tell the computer we want to compose. Enter the Compose command. The "0" means start a new music file.

****Note: follow each pitch entered with a (R) ****

1:1?ER	Enter an Eighth Rest in set 1 of voice 1. That is what "1:1" means.
2:1?EF3	Enter an Eighth note F in the 3rd octave in set 2 of voice 1. Watch the notes appear on the screen! And hear the pitch!
3:1? EA3	And, we continue on entering in each note. We always enter the rhythm, the pitch, and the octave, in that order.
4:1? EF3	If you type a wrong code, the computer will beep, then retype the music note.
5:1? EC4	
6:1? EF3	
7:1? EF4	We have finished one measure.
8:1? SE4	A Sixteenth note in set 8!
9:1? SD4	
10:1? SC4	
11:1? SD4	
12:1? SC4	
13:1? SBF3	There is one more letter here. We need a B Flat. So we use F for flat. If we need a sharp, we would type S.
14:1? SA3	
15:1? SBF3	
16:1? SA3	
17:1? SG3	
18:1? .HF3	Put a dot before the rhythm to make a dotted value!
19:1? * (R)	An asterisk "*" tells the computer to stop composing and return to the command mode. (remember, you must press the **shift** key to get the asterisk.)
??METER # OF BEATS ? 3 (R) BEAT ? 4 (R)	Let's set the Meter.

Example from the instruction manual of entering three measures of music.

The key advantages of Micro Composer are good documentation, simultaneous play and display of music on two staffs, four voices on one board, no need for an external amplifier and a music entry procedure that may be helpful in learning about music (depending upon one's teaching philosophy). The disadvantages are a cumbersome editing process, awkward treatment of key signature and accidentals and an inability to handle certain musical constructions, notably tied notes and triplets.

Is Micro Composer for you? Every Apple needs music and this is certainly one way to get it. ☐

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The MUSIC COMPOSER is an APPLE II® compatibile, low-cost music system designed by the folks at MMI. Our music software was designed by leading experts in music education. A simple step-by-step instruction manual leads you through entering, displaying, editing, and playing music with up to four voices—soprano, alto, tenor, and bass. You can change the sound of each voice to reed, brass, string, or organ sounds and you can even color your own music sounds!

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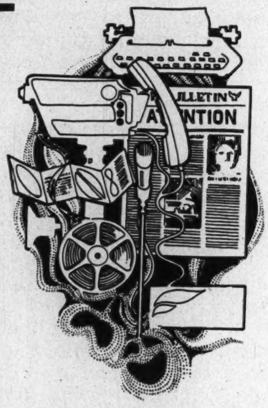
CIRCLE 160 ON READER SERVICE CARD

Reliable copying of TRS-80 tapes

Data Dubber

Rod Hallen



Many cassette tapes which have been generated by some other computer, and some that are created commercially by a tape duplication service, are very difficult to load. This problem is usually caused by a difference in head alignment between recorders and/or by distortion which results from the tape duplication process. Techniques which are satisfactory for copying musical recordings are less than adequate when dealing with data tapes.

While this trouble is not restricted to the TRS-80, the recording-playback technique utilized by Radio Shack is particularly prone to such problems. Most often you can finally get a good load after a lot of fiddling with volume and tone controls. Once a successful load has been accomplished, dumping the program to another tape will usually result in a good copy.

What about system tapes which you cannot dump? A method of regeneration is needed which will create a good copy from an unusable distorted one. Regeneration has been used in the telegraph industry for a great many years.

The Data Dubber, from The Peripheral People, is just such a regenerator. It reads distorted noisy data signals and creates a noise and distortion free copy that is at the proper level for use by the TRS-80.

It can be used in two different ways. Placed between the recorder and the TRS-80 it will, in most cases, deliver usable data signals to the TRS-80. Placed between two recorders, it will allow you to make copies which should be as good as those you get when you CSAVE a program. This is particularly beneficial with programs that do not lend themselves to duplication in any other way.

Application

The Data Dubber has a self-contained battery which should last about 90 days in normal use. There are no switches or controls on the unit. The cover sports an LED indicator, and two plug-ended cords and a jack adorn one end. When used between a recorder and the computer, the unit is in series with the ear phone lead. The most important part of the electrical circuitry is the Threshold Detector. Once the recorder playback volume has been set correctly with the use of the LED indicator, the data out to the TRS-80 will remain constant even if the volume control is increased farther.

Operation of the unit is identical when used between two recorders except that the output of the Data Dubber is fed into the AUX input for recording. Tapes which are copied in this manner should load easily from then on with or without the use of the Data Dubber.

Conclusion

In the past few weeks I have made three tapes usable which were previously super sensitive to volume setting. I have also duplicated all of my system tapes to safeguard my investment in the event a tape should become damaged and unreadable for any reason.

One note of warning is in order. The Data Dubber will only resurrect tapes which contain all of the necessary data no matter how distorted. If even one data or sync bit is missing from the tape, then there is no way to recover the program. In that case you will have to go back to the source for another copy.

The Data Dubber is available from the Peripheral People, at P.O. Box 524, Mercer Island, WA 98040 for $40 postage paid. I have found it to be a usable addition to my TRS-80 and believe that most other users will also. □

Rod Hallen, PO Box 73, Tombstone, AZ 85638.

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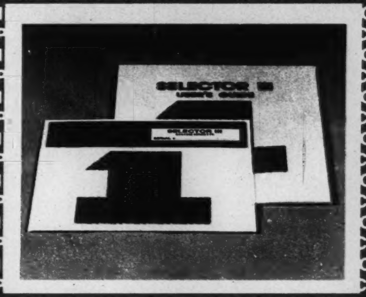

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The system represents the state of the art using Micro-Ap's unique record indexing, query, and report writing methods. It's 'menu driven' and uses screen displays with all the instructions and error sensing that allow the novice to quickly learn the system and accomplish his tasks.

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- select collections of records meeting your exact requirements and arranged in the order wanted.
- create a unique report that contains the precise information you need - with numerical totals, averages, maxima, and minima -for any period of time and summarized by name, date...or by any item you want.
- bring an application on-line in hours instead of months.

CIRCLE 153 ON READER SERVICE CARD

SELECTOR III-C2 is a 'turn-key' system that can manage most applications as is. It includes source-code and pre-defined record formats and sub-programs to perform the tasks listed at top of page. Programmers can easily add other sub-programs - using the system's powerful utilities - to perform virtually any special computation or function required.

The system runs under CBASIC Vers. 2, and is priced at $345. It's available in a variety of CP/M, disk formats including Dynabyte; North Star; Micropolis; TRS-80; Helios II; Heathkit; iCOM; Altair; Imsai; Cromemco; and others.

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creative computing
WORD PROCESSING PROFILE

Word Processor Pac For The Sorcerer

Philip L. Wilkinson

What other microcomputer has plug in ROM pacs that fit in the side as easily as "Johnny Cash's Greatest Hits" fits in my 8-track? The ability to use ROM pacs, together with the great keyboard, were two of the reasons I bought my Sorcerer in the first place, a sullen and frustrated refugee from the promises of Commodore and Mickey Mouse keyboards. But it took a while to get anything else but the Basic pac, and weekends would see me hanging around the Byte shop, looking at the books and magazines.

"Anything new from Exidy?"

"I heard a rumor about a new disk system that fits on the parallel port."

"Really? What about ROM pacs?"

"Give me the money and I'll order the Assembler pac for you. Might take a while but I'm sure we'll get it eventually."

"Thanks but no thanks."

Finally I found a store called Nycom, on El Camino Real, in the heart of Silicon Valley. Nycom got to me at the right time, after a week of blow ups, brown outs and keyboard pounding with a word processor written in Basic. The third time it blew up with four pages of text laboriously entered but unrecorded, I nearly trashed the whole system. I bought the ROM pac before asking the price, and then spent three days with Nycom and a sprinkling of Exidy personnel on the telephone trying to make it print out with my non-standard Selectric terminal. Finally I found the right person and, after a short driver program worked on the second attempt, I felt like I'd found a gold mine.

Philip L. Wilkinson, 755 Pt. San Pedro Rd., San Rafael, CA 94901.

Entering Text

The processor is a treat to use. Screen oriented, one enters text without regard for the end of lines. The pac automatically rolls over words that are too long onto the next line. If the word is polysyllabic like extracalafragalisticexpialidocious, a soft hyphen will break it up and put bits onto both lines, thus avoiding a huge gap in the first line. Later on, if the text gets cut and spliced and the word is no longer at the end of the line, the hyphen is automatically disregarded. Of course, one can vary line length at will. Tabs come automatically set 10 spaces apart, but can easily be changed at the flick of a finger.

It took me about ten lines to forget about carriage returns with this system. Since my typing is very definitely not touch typing, I never knew when I was getting near the end of the line. I was always too busy looking at the keyboard finding the next character, which raises a point worth mentioning. People like myself who hunt and peck and find the wrong character are precisely the ones who benefit most from a processor. What pleasure to throw away the white out, and replace it with a cursor that goes anywhere on the screen, controlled from the numeric pad.

In fact, most commands are controlled from the numeric pad. There are two modes, called Edit and Command modes, and a key on the pad flipflops between each mode. The top line of the video screen is reserved for messages that tell one which mode is current, give error messages, and report cursor position in terms of number of lines from the start of text and number of spaces across the screen.

All text is entered in Edit mode. In fact, all text is entered on the middle line of the screen, with each line scrolling upwards on completion. (I imagine if I was a touch typist this feature might help prevent eyestrain.) To access text that is off the screen is easy from either mode; with the cursor keys in Edit, or with forward and backward commands in Command mode.

What happens if you want to change a word? Easy. Just type over it. Deletions? There is a key for this. Insertions? A key for this too. Okay, but what about lines and paragraphs, doesn't that get tedious letter by letter? Very. Go to Command mode instead, and either Kill the whole text, or Delete as many lines as you want to. Good, but what about rearranging paragraphs without having to type them all over again? Sure. Use the Hold command, Hold the paragraph, delete it from text, and replace it where you want it. Whether text is large or small, the Processor Pac always comes through. (Like the US Mail in the old days, remember?)

Some of the Features

A word about searching capabilities. I find that I type a number of things where a name or phrase is liberally sprinkled throughout the text like sesame seeds on a hamburger. I now type a @ sign for these occurrences, then use search and replace to put in the text I want. One can use wild cards also in this feature. By this I mean that a period can represent any letter. Hence, if I wanted to, I could find all the occurences of "Bob," "Rob," "Gob," "Hob" and "Nob" in my text (if such a

NEW PRODUCTS!

Super Color S-100 Video Kit $99.95

Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K. S-100 bus 1802, 8080, 8085, Z80 etc.

Gremlin Color Video Kit $59.95

32 x 16 alpha/numerics and graphics; up to 8 colors with 6847 chip; 1K RAM at E000. Plugs into Super Elf 44 pin bus. Not expandable to high resolution Graphics.

Elf II Adapter Kit $24.50

Plugs into Elf II providing Super Elf 44 and 50 pin bus plus S-100 bus expansion (With Super Expansion). High and low address displays, state and mode LED's optional **$18.00.**

1802 16K Dynamic RAM Kit $149.00

1802/S-100 expandable to 32K, Hidden refresh w/clocks up to 4 MHz w/no wait states Addl. 16K RAM **$79.00.**

Quest Super Basic

Quest, the leader in inexpensive 1802 systems announces another first. Quest is the first company worldwide to ship a **full size Basic** for 1802 systems. A complete function **Super Basic** by **Ron Cenker** including floating point capability with scientific notation (number range ±.17E^{38}), 32 bit integer ±2 billion; Multi dim arrays; String arrays; String manipulation; Cassette I/O, Save and load, Basic, Data and machine language programs; and over 75 Statements, Functions and Operators.

Easily adaptable on most 1802 systems. Requires 12K RAM minimum for Basic and user programs. Cassette version in stock now. ROM versions coming soon with exchange privilege allowing some credit for cassette version.

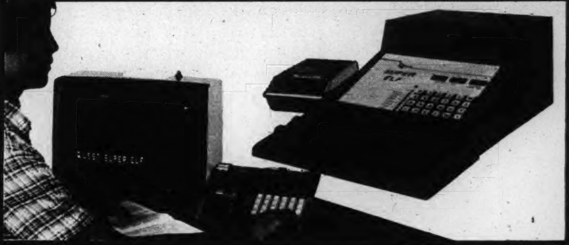
Super Basic on Cassette $40.00

Tom Pittman's 1802 Tiny Basic Source listing now available. Find out how Tom Pittman wrote Tiny Basic and how to get the most out of it. Never offered before. $19.00

S-100 4-Slot Expansion $ 9.95

Super Monitor VI.I Source Listing $15.00

Coming Soon: Assembler, Editor, Disassembler, DA/AD, Super Sound/Music, EPROM programmer.



RCA Cosmac Super Elf Computer $106.95

Compare features before you decide to buy any other computer. There is no other computer on the market today that has all the desirable benefits of the **Super Elf** for so little money. The Super Elf is a small single board computer that does many **big** things. It is an excellent computer for training and for learning programming with its machine language and yet it is easily **expanded** with **additional memory, Full Basic, ASCII Keyboards, video character generation, etc.**

Before you buy another small computer, see if it includes the following features: ROM monitor; State and Mode displays; Single step; Optional address displays; Power Supply; Audio Amplifier and Speaker; Fully socketed for all IC's; Real cost of in warranty repairs; Full documentation.

The **Super Elf** includes a **ROM** monitor for program loading, editing and execution with **SINGLE STEP for program debugging** which is not included in others at the same price. With **SINGLE STEP** you can see the microprocessor chip operating with the **unique Quest** address and data bus displays **before, during** and **after** executing instructions. Also, CPU mode and instruction cycle are decoded and displayed on 8 LED indicators.

An RCA 1861 **video graphics** chip allows you to connect to your own TV with an inexpensive video modulator to do graphics and games. There is a **speaker system** included for writing your own music or using many music programs already written. The speaker amplifier may also be used to drive relays for control purposes.

A 24 key **HEX keyboard** includes 16 HEX keys plus **load, reset, run, wait, input, memory protect, monitor select** and **single step**. Large, on board displays provide output and optional **high and low address**. There is a 44 pin standard connector slot for PC cards and a 50 pin connector slot for the Quest Super Expansion Board. Power supply and sockets for **all** IC's are included in the price plus a detailed 127 pg. instruction manual which now includes over 40 pgs. of software info. including a series of lessons to help get you started and a music program and graphics target game.

Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and research and development.

Remember, other computers only offer Super Elf features at additional cost or not at all. **Compare before you buy. Super Elf Kit $106.95, High address option $8.95, Low address option $9.95. Custom Cabinet** with drilled and labelled plexiglass front panel **$24.95.** Expansion Cabinet with room for 4 S-100 boards **$41.00. NiCad Battery Memory Saver Kit $6.95.** All kits and options also completely assembled and tested.

Questdata, a 12 page monthly software publication for 1802 computer users is available by subscription for $12.00 per year.

Tiny Basic Cassette **$10.00,** on ROM **$38.00,** original Elf kit board **$14.95. 1802 software;** Moews Video Graphics **$3.50.** Games and Music **$3.00,** Chip 8 Interpreter **$5.50.**

Super Expansion Board with Cassette Interface $89.95

This is truly an astounding value! This board has been designed to allow **you** to decide how you want it optioned. **The Super Expansion Board comes with 4K of low power RAM** fully addressable anywhere in 64K with built-in memory protect and a **cassette interface**. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf**. The board includes slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed**. EPROM can be used for the monitor and Tiny Basic or other purposes.

A 1K Super ROM Monitor $19.95 is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatible cassette file) another exclusive from Quest. It includes register save and readout, block move capability and video graphics driver with blinking cursor. Break points can be used with the register save feature to isolate program bugs quickly, then follow with single step. The Super Monitor is written with subroutines allowing users to take advantage of monitor functions simply by calling them up. Improvements and revisions are easily done with the monitor. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

Other on board options include **Parallel Input and Output Ports** with **full handshake**. They allow easy connection of an ASCII keyboard to the input port. **RS 232 and 20 ma Current Loop** for teletype or other device are on board and if you need more memory there are two **S-100** slots for static RAM or video boards. Also a 1K Super Monitor version 2 with video driver for full capability display with Tiny Basic and a video interface board. **Parallel I/O Ports $9.85, RS 232 $4.50, TTY 20 ma I/F $1.95, S-100 $4.50. A 50 pin connector set** with ribbon cable is available at $15.50 for easy connection between the **Super Elf** and the **Super Expansion Board.**

Power Supply Kit for the complete system (see Multi-volt Power Supply).

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7474N	.35
7475N	.49
7485N	.88
7489N	1.85
7490N	.43
7492N	.43
7493N	.43
7495N	.69
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74121N	.34
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74151N	.69
74154N	1.00
74157N	.69
74161N	.87
74162N	.87
74163N	.87
74174N	.96
74175N	.90
74190N	1.15
74192N	.87
74193N	.85
74221N	2.00
74298N	1.65
74365N	.68
74366N	.65
74367N	.68

74LS00 TTL	
74LS00N	.35
74LS02N	.35
74LS04N	.35
74LS05N	.35
74LS08N	.35
74LS10N	.35
74LS13N	.55
74LS14N	1.10
74LS20N	.35
74LS22N	.35
74LS28N	.41
74LS30N	.35
74LS33N	.75
74LS38N	.55
74LS74N	1.25
74LS75N	1.00
74LS90N	.85
74LS93N	.70
74LS95N	1.10
74LS107N	.45
74LS112N	.45
74LS113N	.35
74LS132N	.89
74LS136N	.45
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74LS155N	.85
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LM320T-15	1.60
LM324N	1.15
LM339N	1.55
LM340K-5	1.35
LM340K-8	1.35
LM340K-12	1.35
LM340K-15	1.35
LM340K-24	1.35
LM340T-5	1.25
LM340T-8	1.25
LM340T-12	1.25
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LM379	5.00
LM380N	1.00
LM381	1.60
LM382	1.60
LM703H	.40
LM709H	.28
LM723H/N	.50
LM733N	.87
LM741CH	.35
LM741N	.32
LM747H/N	.75
LM748N	.35
LM1303N	1.75
LM1304	1.10
LM1305	1.27
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CD4050	.49
CD4051	1.13
CD4060	1.42
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Sorcerer, cont'd . . .

peculiar notion overwhelmed me), by telling Sorcerer to search for ".ob."

Automatic pagination and titling is accomodated easily, by using the appropriate command to put the title and the first page number required on the first line of text. As pages are printed, Sorcerer automatically updates the page number.

The Y command controls most of the print options. The Processor Pac accomodates printers on the parallel port of the Sorcerer, or the RS232 port, with drivers for these ports in the ROM pac. For example, connecting a Centronics printer is as trivial as plugging it in and setting the baud rate to 1200 on the printer. If your parallel port printer likes 300 baud, that can also be accomodated by command within the ROM pac without having to go to the monitor. Any 300 or 1200 baud printer that doesn't need handshaking will mate with the RS232 port and run with the driver program in the ROM pac. Just in case you have an old 110 baud neanderthal, or a Selectric that needs its own driver program, Exidy thoughtfully programmed the pac with the jump address of the printer driver in RAM at 7E7 and 7E8. By putting the address of a custom driver program here, Sorcerer will jump to it instead of the built in driver. Figure 1 is a hex dump of the driver program I use with my RS232 Selectric. It is the same program that Exidy uses in the ROM pac to drive an RS232 printer, with the addition of a delay routine to effectively slow 1200 baud to 110 baud or thereabouts. The delay can be changed by varying the number in 17H.

I get into the monitor and Load this program into memory starting at 00H. I then enter the starting address (00H) into 7E7 and 7E8, and go back to the pac with PP. Then I turn the Selectric on, and that's it; instant printing.

The Y command lists several other options, including page length, right justification, number of carriage returns after each line and after each page, left margin width, line width, and various other options for daisy wheel printers, including line feed size, character spacing, special characters and proportional spacing. These all add up to an impressive list of options available, and make this a system suitable for business applications of many kinds.

Of course, all these features and gimcrackery would be of little use if there was no way to save text from one typing session to the next. The system will work with disk storage via the S100 extension box for the Sorcerer and is compatible with CP/M. Nycom had it running with this system with no apparent glitches, but since I have no disk system I can't offer any first hand comments. The default option for data storage is cassette, either under program motor control, or under manual control. This works just fine for me. To record 150 lines of 63 characters takes less than two minutes. It takes me a whole lot longer than that to write the lines, and two minutes doesn't seem very long in the greater scheme of things, but clearly this is slower than disk. At the risk of stating the obvious, everyone has to decide for himself whether the cost benefit ratio of disk versus cassette is right or not.

An important feature of the system is the ability to merge files. Text read back into Sorcerer is automatically appended to existing text. Hence one could have a mailing list in one file and text to be mailed in another, then merge the files and, by macro programming, automatically print the text with addresses for each person.

Macroprogramming you say? What might that be? Up to 512 characters can be placed in the macro buffer forming a rudimentary program for doing repetitive tasks that people find time consuming and boring. Since most commands are single character commands, quite long programs for complicated operations can be written. If I wanted to do double column printing for example, I could program the Sorcerer to print one line, move ahead through text fifty lines to the first line of the second column, print it in the second column, then move back fifty lines to the next line of the first column. If I wanted to send a letter to everybody on my mailing list, I would program Sorcerer to put the text into the hold buffer, jump to the first address, print the address, print the hold buffer, jump forward again to the next address, print it, print the hold buffer again and so on as often as needed. The number of possible operations with this feature are only limited by the operator's imagination and the commands available.

A less sophisticated feature, similar to macroprogramming, is called autocommanding. When Sorcerer is in the command mode, one can enter several commands at once, have them executed in sequence, and repeated as many times as necessary.Both of the above examples could be done in autocommand as well, the difference being that the macroprogram can be stored on the same file as text, while autocommand has to be entered separately every time it is needed.

```
ADDR  0   1   2   3    4   5   6   7    8   9   A   B    C   D   E   F

0000: F5  F5  FD  7E   3D  F6  8O  D3   FE  FD  77  45   F1  CD  12  EO
0010: DB  FD  CB  47   28  FA  3E  25   OE  FF  OD  2O   FD  3D  2O  F8
0020: F1  C9  OO
```

Figure 1

Hex dump of printer driver program for RS232 port. Program effectively delays character output from 1200 baud to 15 characters per second.

Summary

I have talked about many virtues of the Word Processor Pac, but you are no doubt waiting for the hidden gotcha's to crawl out from under their rocks and smile for the camera. So far, I have found few. A slight problem exists with the rollover feature, and when I am typing at full frenzy and hit the end of a line, I suspect that rollover sometimes fails to catch the second or third character rolled over. On the one occasion when I was doing some extensive text alteration with memory full, I noticed that operations were noticeably slower than when there was plenty of memory space. Both of these features are in the class of minor irritations rather than serious complaints, and they deserve their position at the end of this article.

In summary, I find the Word Processor Pac a very professional addition the the already numerous field of word processors. I urge Exidy to get on with the business of producing more of them to make them more available. Rumor has it that Exidy has undergone a small internal staff turnover and I hope that this means more products and support. They have a fine product in their word processor, suitable for business and professional applications. ☐

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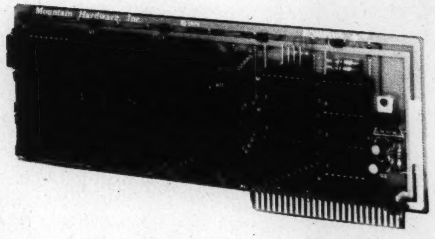

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GENE: Retracing Your Past Through Genealogy

James W. Garson

Using a personal system for genealogy seems like a natural match. For those interested in a more technical description of the program and techniques we'll have a follow-up article in next month's issue.

People seem to be taking a new interest in their relatives, and not necessarily just those living. The TV program "Roots" helped us see what a fascinating thing it can be to try to trace back our family trees. But it isn't all that easy to keep track of a large genealogy. If you try to draw the tree on a giant piece of cardboard you run the risk of running out of room. So why not dust off that personal computer you have in the closet and use it to store data on your genealogy? Of course, you might need a little software to help do the job, so read on to find out more about GENE. GENE is written in TRS-80 Level II BASIC, but I have tried my best to use only those commands and statements that are common to most BASICs.

Session with GENE

To give you an idea of what GENE can do, let's imagine we have just loaded the program into a TRS-80 and typed RUN. After the introduction GENE asks:

```
DO YOU WANT TO LOAD A TAPE?
```

If we had previously run the program and had a tape with data on it to load, the answer would be YES, but since this is our first experience with GENE, we'll reply with NO (or N for short).

Since we don't have a tape, GENE takes out a sample family tree used for demonstration purposes. This tree contains names such as ME, DAD, MOM, AUNT, etc., instead of names of real people. When GENE is finished setting up this tree, it will let us see some more instructions if we desire. After that, GENE starts in on the main part of the program, and the screen looks like this:

```
MOTHER = MOM   FATHER = DAD
      I SEE ME             :
```

GENE is now waiting for us to type a command after the colon. It is showing us where it is looking in the family tree. Now let's "take a walk" in this tree by typing FATHER (or just F for short). Then the screen will look like this:

```
MOTHER = DAD'S MOM
 FATHER = DAD'S PA
  I SEE DAD          :
```

What happened? GENE moved up the tree to the father of the person that it was looking at before (namely ME), so now it is looking at DAD and telling us the names of DAD's parents. If we type FATHER again, we get to look even further back in the tree:

```
MOTHER = GREATGRANDMA
 FATHER = GREATGRAMPS
 I SEE GREATGRANDMA      :
```

It looks as though there isn't any more information on the parents of great-grandma, so this line of the tree has come to an end. Let's go back down to ME, and trace up a different branch of the tree. What we do now is type SEE (or S), and the screen will look like this:

```
      MOTHER = UNKNOWN
      FATHER = UNKNOWN
      I SEE GREATGRANDPA
TO GET OUT OF THIS HIT RETURN
                         :SEE
    WHO WOULD YOU LIKE GENE
                      TO SEE?
```

Now we just type ME, and GENE gets us back to our starting point:

```
MOTHER = MOM   FATHER = DAD
      I SEE ME             :
```

The message about hitting return points out a handy feature of GENE. Nobody is perfect! We're always going to make mistakes during a command, so we'll need a way to get out of any messes. Simply typing return at any point in a command will cancel the input and allow typing a new command at the colon on the right of the screen.

Making Lists

Now let's do something different. We type MOTHER to get up to MOM, and then type LIST (or just L). The screen displays:

```
      MOTHER = MOM'S MOM
       FATHER = MOM'S DAD
        I SEE MOM          :
      I CAN LIST ALL CHILDREN OR
               SIBLINGS OF MOM
 TO GET OUT OF THIS HIT RETURN
                          :LIST
          WHAT RELATIONSHIP
                  DO YOU WANT?
```

Why not dust off that personal computer you have in the closet and use it to store data on your genealogy?

Well, that's handy! I can now check up on something I always forget, the name of my mother's sister. All I have to do is type SIBLINGS (or just S), and I get a list of all mom's siblings:

```
   SIBLINGS OF MOM
   AUNT
```

How silly of me to forget! My mother's sister's name is AUNT. Now I know the name, so I can use SEE to get GENE to look at her, and trace back up her part of the tree.

But right now, we're going to do something else. Let's see what happens if we ask GENE for a list of my children. After typing LIST and CHILDREN, here is what we get:

```
   CHILDREN OF MOM
   ME
   BRO
   SIS
```

Oops, I wanted a list of **my** children, not mom's. I forgot that GENE was still looking at MOM. We have to type SEE,ME and then LIST CHILDREN. GENE types back:

```
   CHILDREN OF ME
```

A blank list! Looks like I don't have any kids. But that is wrong; I happen to have a son. It looks as though I

James Garson, University of Notre Dame, Notre Dame, IN 46556.

Gene, cont'd...

need to introduce him to GENE. To do that I type ADD (or just A) and the screen displays:

```
MOTHER = MOM FATHER = DAD
      I SEE ME          :ADD
             I'M READY TO ADD DATA
                ON A NEW RELATIVE
TO GET OUT OF THIS HIT RETURN
       NAME?
```

You can change the program so it works with your own family tree.

GENE is asking for the name of the person we're adding, so I type MYSON the next question is:

```
SEX?
```

and I answer MALE. GENE asks:

```
FATHER?
```

and I type ME. Finally GENE asks:

```
MOTHER?
```

and I type MYWIFE. GENE promptly responds:

```
I DON'T KNOW THAT PERSON
```

Looks like we haven't introduced GENE to MYWIFE either, but GENE goes ahead with the data received and shows us how things stand:

```
MOTHER = UNKNOWN
  FATHER = ME
  I SEE MYSON
```

You can see GENE does not know who MYSON's mother is. We can fix this up by adding MYWIFE to the program. We will have to use the ADD command to introduce MYWIFE. After that the SEE command is used to get back to MYSON and then type CHANGE (or C) to fix up his data:

"Actually, I didnt even want aluminum siding, but an automatic dialing machine sold it to my automatic answering machine." ©Creative Computing

```
      MOTHER = UNKNOWN
          FATHER = ME
   I SEE MYSON       :CHANGE
      READY TO CHANGE DATA ON
MYSON
      TO GET OUT OF THIS HIT
RETURN
      WHAT DATA DO I CHANGE?
```

We want to change the data on MYSON's mother, so we type MOTHER (or M). GENE responds with:

```
NEW MOTHER'S NAME?
```

MYWIFE is entered. GENE now knows all about my wife. A second later the screen changes to show that things have been fixed up:

```
   MOTHER = MYWIFE
     FATHER = ME
  I SEE MYSON          :
```

You may want to include relationships other than siblings and children, such as brothers, sisters, aunts and uncles.

Listing Descendants

Here is another of GENE's features. We type FATHER twice to get up to DAD, and then type DESCENDANTS (or just D). This gives us a list of all the descendants of my DAD.

```
DESCENDANTS OF DAD
GENERATION 1
CHILDREN OF DAD
ME
BRO
SIS
GENERATION 2
CHILDREN OF ME
MYSON
```

Sure enough, GENE knows enough to count MYSON as one of my DAD's descendants.

The END command terminates GENE. GENE then asks if you want to store the data on tape. After typing YES (or just Y) GENE requests that you load a new tape into the cassette recorder. We type return, the cassette is recorded, and GENE stops after printing a polite BYE! IT IS VERY IMPORTANT TO LOAD A NEW TAPE WHEN YOU ARE STORING DATA. If you forgot to do so, you may write over your copy of GENE. To avoid this, make sure the cassette you store GENE on has the little tabs punched out to prevent recording over it.

Entering Your Own Tree

There are two ways you can change the program so it works with your own family tree. Things are quite easy if you intend to store your data on tape. All you need do is type NEW (or N) to clear off the demonstration data. Then use the ADD command to put in new data on your relatives. You should put in your oldest relatives first so that GENE will already be introduced to fathers and mothers of people you add later on. Once you have built up a part of your family tree this way, you can store it on tape and simply load the tape anytime you use GENE again. You can then throw away lines 1500-1650 and 50-70, in case you want to save space. (I like to keep these lines, though, so I can show off how GENE works to people who don't happen to know anything about my relatives.)

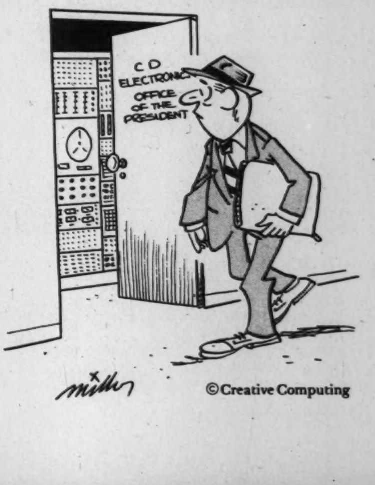
One problem with the TRS-80 is that loading data from tape is a bit slow. It may be easier for you to simply replace the demonstration data in lines 2000 to 5000 with your own. You will have to add your data in by editing the program. The format for the data statement is:

```
DATA "name", "sex", M, F
```

The numbers of M and F should "point" to the data on the mother and father of a person. For example, the statement:

```
DATA "JAMES W. GARSON,"
"MALE," 6, 7
```

records data for me, and it says the data for my mother is in the 6th data statement and data on my father is in the 7th data statement. It is a good idea to number the DATA statements 2001, 2002, 2003, etc., so you can easily see which statement is the 1st, 2nd, 3rd and so on in your list of data. It is important to put DATA "UNKNOWN," "?," 1, 1 as your first data statement, and make sure that the last line (line 5000) reads DATA "", "", 1, 1.



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Gene, cont'd...

GENE improvements

GENE is really only a beginning. There are probably a number of features you want which I haven't thought about, or haven't had the time to put in. A program which did what everybody wants would probably be too large for a microcomputer, so it is better to let people who use GENE modify it to fit their needs. Here are a few guideposts to help you on your way.

Let's begin by explaining how to give GENE the ability to store other kinds of information such as birthdays, names of spouses, addresses, occupations or other notable facts. To store information on birthdays, for example, you need to set up a new array B$, and dimension it:

```
27 DIM B$(100)
```

Then you will need to add "B$(J)" at lines 76, 360 and 1520 to make sure the information stored in B$ will be read from the tape, stored on tape and read from the data in the program. For example, after the modification line 76 should read:

```
76 FOR J = 1 TO P: INPUT#-1,
N$(J), S$(J),M(J),F(J),B$(J):
NEXT J
```

You will also need to change the DATA items in lines 2000-5000 so they include data on birthdays. For example, line 2002 should now read:

```
2002 DATA "ME," "M," 5, 8
"JULY 26 1943."
```

If you are storing your data on tape, you will only need to change the first data statement this way, since the other data statement will be ignored.

You will also need to modify the ADD command to request information on birthdays, just add:

```
225 PRINT "BIRTHDAY";:
GOSUB 1000: B$(P + 1) = R$
```

The CHANGE command also needs a revision:

```
645 IF R$ = "B" THEN PRINT
"NEW BIRTHDAY";:
  GOSUB 1000: B$(K) = R$:
  GO TO 100
```

and the print statement at 658 needs an addition:

One of the basic principles of personal programming should be to train the computer to follow some simple rules of conversational etiquette.

```
658 PRINT "ANSWER, NAME,
SEX, FATHER, MOTHER OR
BIRTHDAY":      GO TO 620
```

Another desired feature is to get GENE to print out data on birthdays, sex, or whatever else you stored. That is easy enough. For example, to get a command that prints the birthday of the person GENE is looking at, just add:

```
194 IF R$="B" THEN PRINT
"BDAY OF";N$(W);" IS
";B$(W): GOTO 1000!!
```

Another part of the program that needs development is the LIST command. You may want to include relationships other than siblings and children, such as brothers, sisters, aunts and uncles. The article, "How to Make a BASIC Tree" (Creative Computing, Nov. 1979) will explain the techniques in detail. Also, examine how the siblings and children feature is programmed in lines 580-599.

A Bit of Philosophy

I'm sure you can think of a lot of other things to add to GENE, but before you go off and experiment with it, I'd like to say a few things about the basic philosophy that went into the design of the program. There are two things I am proud of.

First, you are never stuck in a command. You can always get out by simply hitting return. Second, at any point in the program typing "?" will get you a helpful message telling you what your options are. This means that GENE has to have a number of subroutines to handle interaction with the user, but it is well worth it. One of the basic principles of personal programming should be to train the computer to follow some simple rules of conversational etiquette. These rules include letting people change the topic when they want, as well as helping them out when they get confused.

A final note: you may run out of memory if you put a lot of data into GENE. Not to worry. Just increase the values in the CLEAR and DIMENSION statements in lines 25 and 26. ☐

```
 5 REM ************************************************
10 REM * GENE: A GENEALOGY PROGRAM
11 REM * (C) 1979 BY JIM GARSON
12 REM * DEPT OF PHILOSOPHY, U. OF NOTRE DAME
14 REM * NOTRE DAME, IND 46556
16 REM *************************************************
17 REM * IMPORTANT VARIABLES
18 REM * W   NUMBER OF PERSON GENE IS LOOKING AT
19 REM * P   NUMBER OF PEOPLE YOU HAVE DATA ON
20 REM * N$  ARRAY WITH NAMES IN IT
21 REM * S$  ARRAY WITH SEXES IN IT
22 REM * M   ARRAY WITH NUMBERS OF MOTHERS IN IT
23 REM * F   ARRAY WITH NUMBERS OF FATHERS IN IT
24 REM ******************************************
25 CLEAR(2000)
28 DIM N$(100),S$(100), F(100),M(100)
29 DIM S(10),S1(10)
40 CLS
42 PRINT @400,"HI! I'M GENE!"
 43 PRINT TAB(10);"YOUR FRIENDLY GENEALOGY PROGRAM"
 44 PRINT:PRINT:PRINT"ANYTIME YOU DON'T KNOW WHAT TO DO"
45 PRINT "JUST TYPE QUESTION MARK (?) FOR HELP"
46 PRINT
50 PRINT "DO YOU WANT TO LOAD A TAPE";
 60 R$="":INPUTR$:R$=LEFT$(R$,1)
65 IF R$="Y" THEN 72
66 IF R$="N" THEN 90
67 PRINT "TYPE YES OR NO"
68 PRINT "IF IN DOUBT TYPE NO":GOTO 50
70 PRINT "TYPE YES OR NO"
71 REM * LINES 72-78 LOAD A TAPE
72 PRINT "GET CASSETTE IN RECORDER AND PUSH RECORD BUTTON"
73  PRINT "HIT RETURN WHEN READY"
74  INPUT A$
75  INPUT#-1, P, W .
 76 FOR J=1 TO P:INPUT#-1, N$(J), S$(J),F(J),M(J):NEXTJ
78 GOTO 100
90 GOSUB 1500  REM * LOADS SAMPLE DATA
95 CLS
100 GOSUB 1200: REM *PRINT HEADING
110 PRINT @560, ":";
 120 GOSUB1100 :REM * PUT FIRST CHARACTER OF RESPONSE INTO R$
130 CLS : GOSUB 1200 : REM * PRINT HEADING
135 IF R$="E" THEN 300 : REM * END
140 IF R$="S" THEN 400 : REM * SEE
145 IF R$="A" THEN 200 : REM * ADD
 150 IF R$="D" THEN 700 : REM * DESCENDENTS
155 IF R$="C" THEN 600 : REM * CHANGE
160 IF R$="L" THEN 500 : REM * LIST
 170 IF R$="M" THEN W=M(W):GOTO 100 : REM * MOTHER
 180 IF R$="F" THEN W=F(W):GOTO 100 : REM * FATHER
 185 IF R$="N" THEN:P=1:PRINT@400,"READY FOR NEW DATA":GOTO 100
 190 IF R$="?" THEN GOSUB910:GOTO 100: REM * SEE COMMANDS
195 PRINT @400, "WHAT??? TYPE ? FOR HELP":GOTO 100
200 REM * ADD INFO ON A NEW RELATIVE
235 PRINT @ 192,
207 REM * SUBROUTINE 1000 GETS RESPONSE AND PUTS IN R$
208 PRINT "I'M READY TO ADD DATA ON A NEW RELATIVE"
209 PRINT "IF YOU DON'T WANT TO DO THAT, HIT RETURN. "
 210 PRINT "NAME";:GOSUB 1000:N$(P+1)=R$
 220 PRINT "SEX";:GOSUB 1000:S$(P+1)=R$
 230 GOSUB 1300 :REM * GETS NAMES OF MOTHER FATHER, UPDATES M, F
 240 P=P+1 : REM * P NOW POINTS TO  FIRST EMPTY SPOT IN ARRAYS
250 W=P:GOTO 100
```

Gene, cont'd...

```
300 REM * END CHECK TO SEE IF THEY WANT TO STORE INFO ON TAPE
302 PRINT@ 520, "DO YOU WANT TO STORE WHAT YOU HAVE ON TAPE";
310 GOSUB 1100 : REM * PUTS FIRST CHARACTER TYPED IN R$
320 IF R$="N" THEN 390
325 IF R$="Y" THEN 330
327 PRINT "ANSWER YES OR NO"
328 PRINT "IF YOU AREN'T SURE, TYPE NO"
329 GOTO 302
330 PRINT "GET TAPE LOADED AND PRESS RECORD BUTTONS"
340 PRINT "TYPE RETURN WHEN READY"
345 INPUT R$
350 PRINT#-1, P, W
360 FOR J=1 TO P:PRINT#-1,N$(J),S$(J),F(J),M(J):NEXT J
390 CLS:PRINT@256,"IF YOU WANT TO START ME OVER WITH THE SAME"
392 PRINT "DATA, YOU CAN TYPE CONT AFTER READY"
394 PRINT@400,"BYE!":STOP
395 GOTO 100
400 REM * MAKES GENE LOOK AT RELATIVE NAMED BY THE USER
401 PRINT @256, "TO GET OUT OF THIS HIT RETURN"
402 PRINT "WHO WOULD YOU LIKE GENE TO SEE";
405 GOSUB 1000 : REM * GET INPUT CHECK FOR ? AND EMPTY RESPONSE
410 GOSUB 1400 :REM * FIND NUMBER FOR NAME IN R$, PUT IN J
420 IF J=1 THEN GOTO 100
430 W=J
440 GOTO 100
500 REM * LISTS ALL RELATIVES WITH A GIVEN RELATIONSHIP
502 REM * TO THE PERSON GENE SEES.
504 REM * YOU MAY WANT TO ADD MORE RELATIONSHIPS TO THIS.
506 REM * TO LEARN HOW SEE "HOW TO BUILD A BASIC TREE"
508 PRINT @192,
509 PRINT "I CAN LIST ALL CHILDREN OR SIBLINGS OF ";N$(W)
510 PRINT "TO GET OUT OF THIS HIT RETURN"
515 PRINT "WHAT RELATIONSHIP DO YOU WANT";
520 GOSUB 1100: REM * PUTS FIRST CHARACTER TYPED IN R$
530 IF R$="C" THEN PRINT "CHILDREN OF ";N$(W): GOTO 580
535 IF R$="S" THEN PRINT "SIBLINGS OF ";N$(W): GOTO 590
540 PRINT "ANSWER C FOR CHILDREN OR S FOR SIBLINGS":GOTO 510
580 FOR J=1 TO P: REM * PRINT CHILDREN OF W
582 IF W=M(J) OR W=F(J) THEN PRINT N$(J)
584 NEXT J
586 GOTO 100
590 FOR J=1 TO P: REM * PRINT SIBLINGS OF W
591 IF W=J THEN 594 :REM * DON'T PRINT NAME OF PERSON SEEN
592 IF (F(W)=F(J) AND F(J)<>1) OR (M(W)=M(J) AND M(J)<>1) THEN  PRINT N$(J)
594 NEXT J
599 GOTO 100
600 REM * CHANGES DATA ON PERSON GENE SEES.
615 PRINT@256, "READY TO CHANGE DATA ON ";N$(W)
616 PRINT "TO GET OUT OF THIS HIT RETURN"
618 PRINT "WHAT DATA DO I CHANGE";
620 GOSUB 1100: REM * PUTS FIRST CHARACTER TYPED IN R$
630 IF R$="N"THEN PRINT"NEW NAME"; :GOSUB1000:N$(K)=R$:GOTO 100
640 IF R$="S" THEN PRINT"NEW SEX"; :GOSUB1000:S$(K)=R$:GOTO 100
650 IF R$="M" THEN GOTO 670
655 IF R$="F" THEN.GOTO 680
658 PRINT "ANSWER NAME, SEX, FATHER OR MOTHER":GOTO 620
670 INPUT "NEW MOTHER'S NAME"; R$: GOSUB 1400
672 M(W)=J: GOTO 100
680 INPUT "NEW FATHER'S NAME"; R$: GOSUB 1400
682 F(W)=J: GOTO 100
700 REM * PRINT DESCENDENTS
705 G=0
707 PRINT @ 192,
708 IF W=1 THEN PRINT "PERSON UNKNOWN":GOTO 100
710 PRINT "DESCENDENTS OF ";N$(W)
711 C=1:S(C)=W
712 G=G+1
715 PRINT "GENERATION "; G
720 F1=0
725 FOR K=1 TO C
730 PRINT "CHILDREN OF ";N$(S(K))
732 C1=0
735 FOR J=1 TO P
740 IF F(J)=S(K) OR M(J)=S(K) THEN C1=C1+1:S1(C1)=J:PRINT N$(J)
745 NEXT J
750 IF C1>0 THEN F1=1
755 NEXT K
760 IF F1=0 THEN INPUT"HIT RETURN TO CONTINUE";R$:GOTO 100
765 C=C1:FOR K=1 TO C1:S(K)=S1(K):NEXT K: GOTO 712
910 CLS:
912 PRINT "COMMANDS CAN ALL BE SHORTENED TO THEIR FIRST LETTER"
914 PRINT "  END     GIVES YOU THE OPPORTUNITY TO STORE DATA"
916 PRINT "          ON TAPE, AND THEN STOPS"
918 PRINT "  SEE     GENE WILL LOOK AT A PERSON YOU NAME"
920 PRINT "  MOTHER  GENE WILL LOOK AT THE MOTHER OF THE"
930 PRINT "          PERSON SEEN"
940 PRINT "  FATHER  GENE WILL LOOK AT FATHER OF PERSON SEEN"
945 PRINT "  ADD     ADD DATA ON A NEW PERSON"
950 PRINT "  CHANGE  CHANGE DATA ON PERSON SEEN BY GENE"
955 PRINT "  LIST    LISTS ALL PEOPLE WITH A GIVEN RELATION-"
960 PRINT "          SHIP TO PERSON SEEN BY GENE"
970 PRINT " DESC   LISTS ALL DESCENDENTS "
980 PRINT "          OF PERSON GENE SEES"
982 PRINT " NEW     CLEARS OFF OLD TREE SO YOU CAN START OVER"
990 PRINT " ?       TO SEE THIS LIST OR FOR HELP"
995 INPUT "HIT RETURN TO CONTINUE"; R$
999 CLS:RETURN
1000 REM*PUTS USER'S RESPONSE IN R$ GOES TO 100 IF RETURN HIT
1010 R$="":INPUTR$:IF R$="" THEN  100
1020 RETURN
1100 REM * PUTS FIRST CHARACTER IF USER'S RESPONSE IN R$
1110 REM * IF RETURN WAS HIT GOES TO 100
1120 R$="":INPUT R$:R$=LEFT$(R$,1):IF R$="" THEN 100
1130 RETURN
1200  REM * PRINTS HEADING
1210 PRINT @0,
1220 PRINT @0,TAB(4);"MOTHER = ";N$(M(W)),TAB(38);"FATHER = ";N$(F(W));"
1230 PRINT TAB(20); "I SEE ";N$(W)
1240 RETURN
1300 REM * THIS SUBROUTINE TAKES MOTHERS AND FATHER NAMES
1310 REM * AND STORES THEIR CORRESPONDING NUMBERS AT
1320 REM * LOCATION P+1 IN ARRAYS M AND F
1330  PRINT "MOTHER"; :GOSUB1000: REM * PUT RESPONSE IN R$
1340 GOSUB 1400 : REM * GET NUMBER FOR NAME IN R$
1350 M(P+1)=J
1360 PRINT "FATHER"; :GOSUB1000: REM * PUT RESPONSE IN R$
1370 GOSUB 1400
1380 F(P+1)=J
1390 RETURN
1400 REM * TAKES NAME IN R$ AND PUTS ITS NUMBER IN J
1410 FOR J=1 TO P
1420 IF N$(J)=R$ THEN 1460
1430 NEXT J
1440 PRINT "I DON'T KNOW THAT PERSON": J=1
1460 RETURN
1500 REM * THIS LOADS DEMONSTRATION DATA
1502 REM * TO BUILD YOUR OWN FAMILY TREE
1504 REM * USE THE NEW COMMAND TO ERASE DEMONSTRATION DATA
1506 REM * THEN USE THE ADD COMMAND TO PUT IN YOUR TREE
1508 REM * THIS WORKS IF YOU ARE STORING DATA ON TAPE
1510 REM * IF YOU WANT TO STORE DATA IN THE PROGRAM
1512 REM * YOU WILL NEED TO EDIT LINES 2000-5000
1514 REM * EACH DATA STATEMENT HAS THE FORM
1516 REM * DATA "NAME","SEX",M,F
1518 REM * M IS THE NUMBER OF THE DATA STATEMENT
1520 REM * WHERE DATA THE MOTHER OF THIS PERSON IS STORED
1522 REM * AND F IS THE PLACE WHERE DATA ON THE FATHER IS.
1540 W=2 : REM * W IS PERSON GENE IS LOOKING AT
1550 P=0
1555 P=P+1
1560 READ N$(P),S$(P),M(P),F(P)
1570 IF N$(P)="" THEN 1600
1580 GOTO 1555
1600 CLS:PRINT "I JUST LOADED A SAMPLE FAMILY TREE SO THAT
1610 PRINT "YOU CAN GET AN IDEA OF WHAT I CAN DO."
1620 PRINT "YOU WILL SEE NAMES LIKE ME, MOM, DAD,AUNT, ETC."
1630 PRINT "INSTEAD OF NAMES OF ACTUAL PEOPLE."
1640 PRINT "I WILL START BY PRINTING THE NAME OF THE PERSON
1650 PRINT "I AM LOOKING AT IN THE TREE, AND THE NAMES OF THIS"
1660 PRINT "PERSON'S PARENTS. I SUGGEST YOU TRY OUT THE"
1670 PRINT "MOTHER AND FATHER COMMANDS FIRST."
1680 PRINT "PLAY AROUND 'TIL YOU ARE USED TO ALL THE COMMANDS"
1690 PRINT "TO PUT IN YOUR OWN FAMILY TREE USE THE NEW COMMAND"
1695 PRINT "TO CLEAR OFF THE DEMONSTRATION TREE."
1700 PRINT "THEN USE THE ADD COMMAND TO PUT IN DATA ON"
1710 PRINT "YOUR REALTIVES."
1720 PRINT "TO SEE A LIST OF THE COMMANDS OR FOR HELP TYPE ?"
1730 R$="":INPUTR$:R$=LEFT$(R$,1)
1735 IF R$="?" THEN GOSUB910
1740 CLS:RETURN
2001 DATA "UNKNOWN", "?", 1,1
2002 DATA "ME", "M",5,8
2003 DATA "BRO", "M", 5,8
2004 DATA "SIS", "F", 5,8
2005 DATA "MOM", "F",6,7
2006 DATA "MOM'S MOM", "F",1,1
2007 DATA "MOM'S DAD", "M",1,1
2008 DATA "DAD", "M",9,10
2009 DATA "DAD'S MOM", "F",1,1
2010 DATA "DAD'S PA","M",12,11
2011 DATA "GREATGRAMPS", "M",1,1
2012 DATA "GREATGRANDMA", "F",1,1
2013 DATA "AUNT", "F",6,7
2014 DATA "COUSIN", "M", 13,1
5000 DATA "","",1,1
```

Eliminating troublesome calculations

Genetics Calculations in Basic

Peter Koski

Unlike Fortran, Basic allows for logical manipulation of alphanumeric information (strings) as well as complex mathematical calculations. Thus, by combining the two, very powerful problem solving is available to the user. The following program takes advantage of both of these, particularly Basic's ability to handle complex strings.

Most work in genetics involves the cross between two parents, and the subsequent study of the resulting off-spring. When more than two or three genes are involved, or when sex-linked characteristics are analyzed, the results can be staggering. Often, the time spent in reaching these results is also staggering.

Peter Koski, 27 Dogwood Dr., Allendale, NJ 07401.

Using The Program

Referring to the sample run, parent one has been entered as being a heterozygous brown-eyed, homozygous tall male; parent two as a heterozygous brown-eyed, heterozygous tall female. The program then promptly returns the "gamete number" (total different gene combinations for each parent). The gametes of each parent are then printed out along with a list of the resulting off-spring.

The program doesn't end here, however, as the "Pertinent Statistics Subprogram" takes over the job of sorting out this mess. By entering one or two genes of interest, the subprogram will count the number of occurrences of each gene or combination of two genes, as well as compute the gene frequency.

This program was written for use on an Ohio Scientific Challenger II with a printer attached to the serial port. The printer is optional, as a subroutine within the program monitors the "ESC" key to provide alternate start/stop control of the listings.

The program runs fine with 8K, however, more memory would permit crosses of greater complexity. The program as it is presented here allows for a maximum of 128 off-spring (only 16 are possible when running with 8K) in crosses involving 6 genes or less. To increase these limits, the DIMension statements must be changed, as well as the housekeeping For/Next loop in statements 1790-1810. □

```
990 REM    >>>>>  AUTHORED BY PETER KOSKI  <<<<<
995 REM    >>>>>        APRIL, 1979       <<<<<
1000 DIM G1$(6), G2$(6), A$(16,6), B$(16,6), OS$(128)
1010 FOR CLR=1 TO 25: PRINT: NEXT CLR
1020 PRINT "              ** GENETICS PROGRAM **"
1030 PRINT
1040 PRINT "    OFFSPRING GENERATION AND CORRESPONDING STATISTICS"
1050 PRINT:PRINT "                    ---------":PRINT
1060 PRINT "SHIFT LOCK MUST BE RELEASED.  USE LEFT SHIFT TO ENTER CA";
1070 PRINT "PITALS":PRINT
1075 PRINT "                  ---------":PRINT
1077 PRINT "DURING LISTINGS, SCROLL MAY BE STOPPED / STARTED USING ";
1078 PRINT "'ESC' KEY"
1080 PRINT:PRINT "                    ---------":PRINT
1090 PRINT:INPUT "ENTER PARENT 1";P1$
1100 PRINT:INPUT "ENTER PARENT 2";P2$
1110 FOR A=1 TO (LEN(P1$)/2)
1120 G1$(A)=MID$(P1$,(A+(A-1)),2)
1130 NEXT A
1140 FOR B=1 TO (LEN(P2$)/2)
1150 G2$(B)=MID$(P2$,(B+(B-1)),2)
1160 NEXT B
1170 G=0
1180 FOR C=1 TO (LEN(P1$)/2)
1190 IF LEFT$(G1$(C),1)<>RIGHT$(G1$(C),1) THEN G=G+1
1200 NEXT C
1210 PRINT:PRINT "PARENT 1 HAS";INT(2^G);"GAMETE POSSIBILITIES"
1220 GI=0
1230 FOR D=1 TO (LEN(P2$)/2)
1240 IF LEFT$(G2$(D),1)<>RIGHT$(G2$(D),1) THEN GI=GI+1
1250 NEXT D
1260 PRINT:PRINT "PARENT 2 HAS";INT(2^GI);"GAMETE POSSIBILITIES"
1270 FOR CLR=1 TO 16
1280 FOR CR=1 TO 6
1290 A$(CLR,CR)=CHR$(32)
1300 B$(CLR,CR)=CHR$(32)
1310 NEXT CR
1320 NEXT CLR
1325 REM———PARENT 1 GAMETES
1330 FOR E=1 TO (LEN(P1$)/2)
1340 IF LEFT$(G1$(E),1)<>RIGHT$(G1$(E),1) THEN 1380
1350 FOR E1=1 TO (2^G)
1360 A$(E1,E)=LEFT$(G1$(E),1)
1370 NEXT E1
1380 NEXT E
1390 F2=-1
1400 FOR F=(LEN(P1$)/2) TO 1 STEP -1
1420 IF LEFT$(G1$(F),1)=RIGHT$(G1$(F),1) THEN 1490
1425 F2=F2+1
1430 FOR F1=1 TO (2^G) STEP (2^F2)
1440 A$(F1,F)=LEFT$(G1$(F),1)
1450 NEXT F1
1460 FOR F1=(1+2^F2) TO 2^G STEP (2^(F2+1))
1470 A$(F1,F)=RIGHT$(G1$(F),1)
1480 NEXT F1
1490 NEXT F
1495 IF 2^G=1 THEN 1550
1500 FOR G1=2 TO 2^G
1510 FOR G2=1 TO (LEN(P1$)/2)
1520 IF A$(G1,G2)=CHR$(32) THEN A$(G1,G2)=A$((G1-1),G2)
1530 NEXT G2
1540 NEXT G1
1550 REM———PARENT 2 GAMETES
1560 FOR H=1 TO (LEN(P2$)/2)
1570 IF LEFT$(G2$(H),1)<>RIGHT$(G2$(H),1) THEN 1610
1580 FOR H1=1 TO (2^GI)
1590 B$(H1,H)=LEFT$(G2$(H),1)
1600 NEXT H1
1610 NEXT H
1620 F2=-1
1630 FOR I=(LEN(P2$)/2) TO 1 STEP -1
1640 IF LEFT$(G2$(I),1)=RIGHT$(G2$(I),1) THEN 1720
1650 F2=F2+1
1660 FOR I1=1 TO (2^GI) STEP (2^F2)
1670 B$(I1,I)=LEFT$(G2$(I),1)
1680 NEXT I1
1690 FOR I1=(1+2^F2) TO 2^GI STEP (2^(F2+1))
1700 B$(I1,I)=RIGHT$(G2$(I),1)
1710 NEXT I1
1720 NEXT I
1730 IF 2^GI=1 THEN 1790
1740 FOR J1=2 TO 2^GI
1750 FOR J=1 TO (LEN(P2$)/2)
1760 IF B$(J1,J)=CHR$(32) THEN B$(J1,J)=B$((J1-1),J)
1770 NEXT J
1780 NEXT J1
1785 REM———GENERATE OFFSPRING
1790 FOR L=1 TO 128
1800 OS$(L)=CHR$(32)
1810 NEXT L
1820 W=0
1830 FOR X=1 TO 2^G
1840 FOR Z=1 TO (2^GI)
1850 W=W+1
1860 OS$(W)=A$(X,1)+B$(Z,1)+A$(X,2)+B$(Z,2)+A$(X,3)+B$(Z,3)+A$(X,4)
1870 OS$(W)=OS$(W)+B$(Z,4)+A$(X,5)+B$(Z,5)+A$(X,6)+B$(Z,6)
1880 NEXT Z
1890 NEXT X
1900 REM———OUTPUT
```

Genetics, cont'd . . .

```
1905 POKE 517,255
1910 PRINT:PRINT "GAMETES OF PARENT 1:":PRINT
1920 FOR GP=1 TO 2^G
1925 PRINT SPC(20);
1930 FOR GU=1 TO (LEN(P1$)/2)
1940 PRINT A$(GP,GU);
1945 GOSUB 4000
1950 NEXT GU
1960 PRINT
1970 NEXT GP
1980 PRINT:PRINT "GAMETES OF PARENT 2:":PRINT
1990 FOR GP=1 TO 2^GI
1995 PRINT SPC(20);
2000 FOR GU=1 TO (LEN(P2$)/2)
2010 PRINT B$(GP,GU);
2015 GOSUB 4000
2020 NEXT GU
2030 PRINT
2040 NEXT GP
2050 PRINT:PRINT "OFFSPRING ——":PRINT
2060 FOR WY=1 TO ((2^G)*(2^GI)) STEP 2
2070 PRINT SPC(5); OS$(WY),OS$(WY+1)
2075 GOSUB 4000
2080 PRINT
2090 NEXT WY
2100 PRINT:PRINT " PERTINENT STATISTICS SUBPROGRAM — '##' CANCEL";
2105 PRINT "S SUBPROGRAM"
2110 PRINT:PRINT "GENE(S)      TIMES OCCURING         %"
2120 PRINT:INPUT GN$
2130 IF LEFT$(GN$,1)="#" THEN 2220
2140 ON LEN(GN$)/2 GOSUB 5000,6000
2200 PRINT SPC(19) CC SPC(12) ((CC/((2^G)*(2^GI)))*100)
2210 GOTO 2120
2220 POKE 517,0
2225 PRINT:PRINT:INPUT "IS ANOTHER CROSS TO BE MADE";YN$
2230 IF LEFT$(YN$,1)="Y" THEN 1000
2240 GOTO 7000
4000 REM———SCROLL CONTROL
4010 IF PEEK(57088)=32 THEN 4030
4020 RETURN
4030 FOR VV=1 TO 200: NEXT VV
4040 IF PEEK(57088)<>32 THEN 4040
4050 FOR VV=1 TO 100:NEXT VV
4060 RETURN
5000 REM———SINGLE GENE COUNT
5010 CC=0
5020 FOR W=1 TO ((2^G)*(2^GI))
5030 FOR WW=1 TO LEN(OS$(1)) STEP 2
5040 IF MID$(OS$(W),WW,2)=GN$ THEN CC=CC+1: GOTO 5070
5050 IF MID$(OS$(W),(WW+1),1)<>LEFT$(GN$,1) THEN 5070
5060 IF MID$(OS$(W),WW,1)=RIGHT$(GN$,1) THEN CC=CC+1
5070 NEXT WW
5080 NEXT W
5090 RETURN
6000 REM———DUAL GENE COUNT
6010 CC=0
6020 FOR W=1 TO ((2^G)*(2^GI))
6030 FOR WW=1 TO LEN(OS$(1)) STEP 2
6040 IF MID$(OS$(W),WW,2)=LEFT$(GN$,2) THEN 6070
6050 IF MID$(OS$(W),(WW+1),1)<> LEFT$(GN$,1) THEN 6100
6060 IF MID$(OS$(W),WW,1)<>MID$(GN$,2,1) THEN 6100
6070 FOR WW=1 TO LEN(OS$(1)) STEP 2
6075 IF MID$(OS$(W),WW,2)=RIGHT$(GN$,2)THENCC=CC+1:GOTO6100
6080 IF MID$(OS$(W),(WW+1),1)<>MID$(GN$,3,1) THEN 6100
6090 IF MID$(OS$(W),WW,1)=RIGHT$(GN$,1) THEN CC=CC+1
6100 NEXT WW
6110 NEXT W
6120 RETURN
7000 END
```

```
OFFSPRING —

    BBTTXX              BBTtXX

    BbTTXX              BbTtXX

    BBTTYX              BBTtYX

    BbTTYX              BbTtYX       COMPUTER
                                     OUTPUT
    bBTTXX              bBTtXX
                                     (THE REAL
    bbTTXX              bbTtXX       TIME-SAVER)

    bBTTYX              bBTtYX

    bbTTYX              bbTtYX


 PERTINENT STATISTICS SUBPROGRAM — '##' CANCELS SUBPROGRAM

GENE(S)      TIMES OCCURING         %

? BBTT  INPUT
                   2                12.5  OUTPUT

? bbXY
                   2                12.5

? Tt
                   8                50

? ##



             ** GENETICS PROGRAM **

     OFFSPRING GENERATION AND CORRESPONDING STATISTICS

                     ————

SHIFT LOCK MUST BE RELEASED.  USE LEFT SHIFT TO ENTER CAPITALS

                     ————

DURING LISTINGS, SCROLL MAY BE STOPPED / STARTED USING 'ESC' KEY

                     ————


ENTER PARENT 1? BbTTXY
                                USER - INPUT
ENTER PARENT 2? BbTtXX
PARENT 1 HAS 4 GAMETE POSSIBILITIES

PARENT 2 HAS 4 GAMETE POSSIBILITIES
GAMETES OF PARENT 1:

                   BTX
                   BTY
                   bTX                COMPUTER
                   bTY                OUTPUT


GAMETES OF PARENT 2:

                   BTX
                   BtX
                   bTX
                   btX
```

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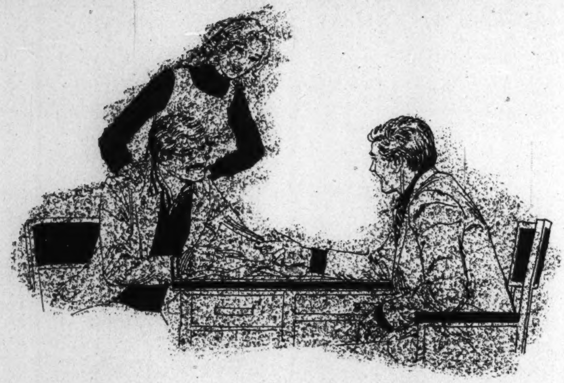
CIRCLE 182 ON READER SERVICE CARD

How much is enough?

Personal Estate Planning



Larry Buss

Introduction

If the breadwinner in your family were to die today, would his or her estate adequately provide for your current and future family needs? How much do you have to supplement your family's monthly income, to educate your children, to discharge your debts, to possibly provide for dependent parents and to pay death taxes and other estate taxes. Government benefits alone will probably fall short in providing the standard of living you desire for your family. In this article, a technique for estate planning will be presented. Although it is not capable of providing a definitive answer to the complex question of how much is enough, it will at least permit you to approximate your estate needs at various intervals in your life. The approach suggested is not the only means of estimating such requirements, nor could unqualified reliance be placed upon it or any similar technique. Moreover, it only supplies a rough minimum dollar goal that will continually change with time and circumstances. This technique was introduced by Kinevan in his book, **Personal Estate Planning.** Prentice Hall is planning to publish his book and it will be available in 1980. I have taken the technique as explained in Kinevan's book and programmed it in Level II BASIC for the TRS-80 computer. Both a 16K and 32K version are available. The 16K version has all capabilities of the 32K version with exception of dependency and indemnity compensation for military personnel. The program listed with this article is the 32K version, and has not been optimized for speed or storage space. Rather than using Present Value and Present Value of Annuity tables as given in his book, I have used closed formulas in developing the computer program. Currently, this program is on cassette and is operated in an interactive mode with the user. All outputs appear on the video monitor and therefore you do not need a printer in running the current version of the program.

Constructing an Estate Programming Chart

Initially, we'll discuss the construction of an Estate Programming Chart as given in Kinevan's book by using paper, pencil, calculator and arithmetic chart paper. The largest and by far the most important need would be supplementary income for your wife and children. An exercise called estate programming will give you a rough idea of how much should be available for this purpose.

Any number of factors, both foreseeable and unforeseeable, could alter it considerably.

The first step is to estimate the monthly income your survivors will need, assuming you were to die within the next few months. Essentials such as housing, food and clothing must be considered, of course, as well as other expenses which, although not necessities, contribute significantly to well-being and enjoyment. Obviously, such an estimate will vary with each family. You might work this out in detail, but if you assume the need will be 75% of present monthly income, you should be sufficiently close. Any future erosion in the purchasing power of the dollar will be a critical consideration when it comes to making disposition arrangements or investing estate assets, but for purposes of approximating your current requirements, disregard inflation.

The monthly income figure then is plotted on a piece of paper on which the vertical scale represents dollars and horizontal scale indicates years commencing with the assumed date of death, which is labeled year 0. Common arithmetic chart paper is convenient for this purpose.

After you have entered your monthly income-for-survivors goal on the chart, the next step is to plot in the survivors benefits to which your dependents might be entitled (Dependency and Indemnity Compensation (DIC), Social Security, or Survivors Benefit Plan (SBP)). These will vary from time to time, so any approximation of estate requirements has only temporary value.

The following example assumes you are in the military service and therefore Dependency and Indemnity Compensation must be considered. The computer program allows the user to either select or not select this option. But to illustrate, assume you are a 28-year-old captain with 6 years of service and that you have a 26-year-old wife, Irmatrude, and two children, Alpha, who is 4, and Omega, who is 1. If you decide that your family would require a monthly income of at least $1,400, you first would draw a horizontal line on your chart representing this goal. Next, you would compute the government survivors' benefits to which they would be entitled. Dependency and Indemnity Compensation of $426 a month would be paid to Irmatrude until Alpha reaches age 18, then $395 a month until Omega reaches age 18, and then $364 a month for the rest of her life or until she remarried. These figures are then entered on the chart. Assume your average monthly wage for Social Security purposes is such that Irmatrude would receive $814 a month from this source until Alpha is 18, which would be in 14 years, and that this benefit then would drop to $699 until

Larry Buss, 101 South U St., Apt. 1, Lompoc, CA 93436.

Planning, cont'd . . .

Omega is 18, after which it would terminate until Irmatrude, at age 65, becomes entitled to $466 a month; this latter date would be 39 years from the assumed date of your death, which is represented by the "0" year at the far left of your chart. After plotting these various sums, your estate programming chart should resemble Figure 1.

At this point, it is readily apparent that standing alone, the survivors' benefits would not be adequate. For convenience, you might label and number the four different periods in which the combined DIC and Social Security payments fail to meet your $1,400 a month goal as "gaps." Thus, to achieve $1,400 monthly during Gap 1, an additional $160 a month must be provided from some source. Similarly, Gap 2 requires $306, Gap 3 $1,036 and Gap 4 $570 monthly.

Determining the total number of dollars necessary to fill each of these gaps would simply be a matter of multiplying these monthly shortages by 12 times the number of years in each period. But this would be almost as illusory as the "estate-equal-to-all-future-earnings" fallacy. It disregards the fact that the funds to be used to supplement the government benefits are not all needed at the time of death, but rather over an extended period and, until actually needed, the estate could be invested and earnings from it used or added to principal. Hence, the inquiry should be: how much is needed at the assumed date of death to provide income sufficient to fill each gap?

There is nothing difficult about ascertaining this figure, and any reasonably bright fifth grader equipped with the appropriate mathematical tables and an explanation of how to use them should be capable of providing a correct answer. The tables needed are Present Value of Annuity (PVA) and Present Value (PV). These may be found in most books of standard mathematical tables.

With PVA and PV tables, together with a pencil, scratchpad and a calculator, you can come up with a rough estimate of the principal sum your family would require to supplement its monthly income. How much is needed at the assumed date of death to fill each gap is first determined, then these sums are totaled.

Roughly approximate the potential shrinkage of assets that will be caused by the expenses of death taxes and estate administration.

Gap 1. The deficiency here is $160 a month, or $1,920 a year, for a period of 14 years. To determine how much would have to be available at the beginning of the period (year "0"), the annual requirement ($1,920) is merely multiplied by some factor opposite "14" in the "years" column of the Present Value of Annuity table.

The particular percentage column you use depends upon what rate of return you believe your estate would realize. This, in turn, depends not only upon what disposition you have arranged (e.g., a life insurance installment settlement option, a trust, a mutual fund withdrawal plan, or outright cash bequests to the widow to manage), but also upon several variables that cannot be precisely determined (e.g., yields and capital appreciation on funds held in trust or invested in securities). Moreover, you might decide that a disposition plan using two or more devices is the safest. Therefore, about the best you can do is to select some conservative yield figure that, barring anything short of a major financial catastrophe, should be realized. For these purposes, if you err, do so on the conservative side by assuming that your estate would return only 5% after taxes.

As the period in question lasts for 14 years, the factor opposite "14" in the "years" column and under ".05 (5%)" is 9.8981. This simply means that if you invested $9.90 at 5% compounded interest, at the end of the first year and each of the following 13 years, you could withdraw $1, and after 14 years nothing would be left. Consequently, since the annual requirement is $1,920, multiply 1,920 by 9.8981 and you have the answer to how much is needed to "fill" Gap 1. The product is $19,004.35 or, in round figures, about $19,000.

Gap 2. There is one additional step involved in determining the sum necessary at year "0" to fill Gap 2, which commences 14 years later. But first, it is necessary to go through a computation similar to that for Gap 1. Here, the dollar deficiency is $306 a month of $3,672 a year for a 3 year period (from year "14" through year "17"). Thus, going again to the PVA table, the factor opposite "3" in the years column and under the 5% column is 2.7232. Multiplying 2.7232 by 3,672 gives an answer of about $10,000.

Don't be discouraged by what, to most young people, might seem to be an unreachable goal.

Now, here is where the second step comes in. Ten thousand dollars at 5% would provide an income of $3,672 a year for a 3-year period. But the 3-year period in question does not commence until 14 years after assumed year of death. Hence, the inquiry becomes: if invested to yield 5% compounded annually, what principal sum would be necessary at the beginning of a 14 year period, so that at the end of 14 years the principal and earnings would equal $10,000? This is where the Present Value table comes in. Opposite "14" in the years column and below the 5% column you will find the factor 0.5051. This merely means that if you invest about 51 cents at 5% after 14 years you would have $1. Therefore, simply multiply 0.5051 by 10,000 and the answer, about $5,050, is the sum which would be needed in year "0" to fill Gap 2.

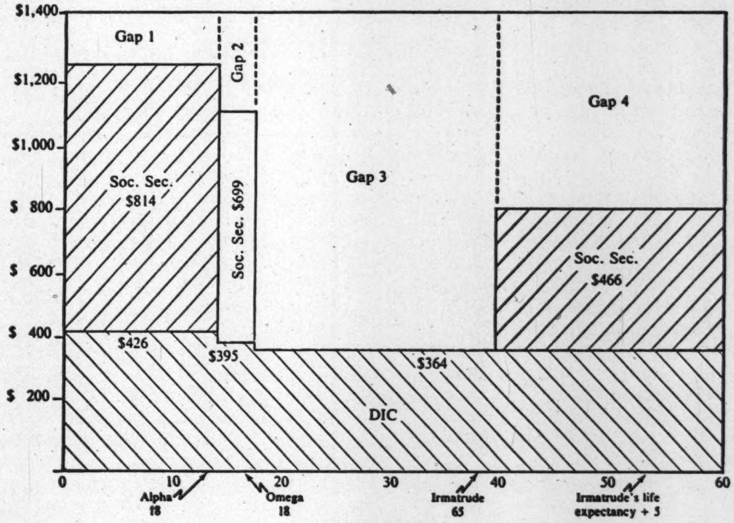


FIGURE 1

Planning, cont'd...

Gap 3. Computations similar to those for Gap 2 are used here. One thousand thirty six dollars a month or $12,432 a year is needed for 22 years (from year 17 through year 39). Thus, again assuming a 5% return, the factor 13.1630 is taken from the PVA table. Multiplying 12,432 by this indicates that when the gap commences, about $164,000 would be required. But as this gap is 17 years away from the assumed date of death, 164,000 multiplied by 0.4363 (from the PV table), or about $71,600, is the sum that would have to be in the estate to provide for Gap 3.

Too many unforeseeable developments are bound to distort your assumptions, and they do not reckon with the inroads of inflation.

Gap 4. The same procedure is used, except that the termination date is not known. To estimate when this might occur (when the widow will die), refer to the mortality table currently used by insurance companies to estimate how long females of various ages should live. And to avoid endangering an elderly widow's means of support, add about 5 years. For this illustration, at the time of your assumed date of death, your widow would be 26. The mortality table indicates that her life expectancy would be about 48 more years, or until age 74. To be conservative, though, assume she will live another 5 years beyond this, or until age 79. Thus, Gap 4, which commences 39 years after year "0", would end 14 years later or at 0 plus 53 years.

The income deficiency during this period is $570 a month of $6,840 a year. Hence, 9.8981 times 6.840 or about $67,700 would be necessary at the beginning of the gap. And 0.1491 times 67,700 or about $10,100 should be available at the assumed time of death.

Minimum Net Estate Required. By adding the sums needed at year "0" to fill each of the four gaps, the minimum amount your survivors would need to supplement their government benefits can be estimated. Thus, $19,000 + $5,050 + $71,600 + $10,100, or a total of $105,750, should be provided for this purpose.

Remember, though, that this woud be no more than a rough planning figure, and that any number of factors, both foreseeable and unforeseeable, could alter it considerably. However, it is a starting point, and most people fail to get even this far in planning for survivors' needs.

Additional Requirements to Consider

In addition to the primary need to have enough to supplement your survivors' other income, your estate should be large enough to discharge your debts, to pay for the costs of administration and any death taxes that might be due, and assuming you have children and typical parental ambitions, to provide college educations for your children. A number of other things — such as financial assistance for low-income parents, or funds to enable a widow who is not otherwise so qualified to obtain the education or training necessary for employment — might be appropriate considerations in particular cases, but for our present purpose we shall disregard them.

Debts. Indebtedness will fluctuate, of course, but let's assume you owe a total of $5,000 to creditors. If there were a real estate mortage note outstanding, the unpaid balance should be included in your calculations.

College Costs. Based upon current costs, four years as a resident at a state college or university requires about $18,000 for tuition, room and board, books, incidentals and travel; at a private school, the average figure is approaching $30,000. Although these costs are expected to increase significantly over the years, to provide both of the children in our example with $24,000 when they become 18 would require, at ages 1 and 4, the sum of 0.4363 (24,000) plus 0.5051 (24,000), or about $22,600 (The factors are from the 5% column of the Present Value Tables). Of course, a child might be expected, through summer employment or otherwise, to contribute something to his or her own education, but if you want to be safe, include the $22,600 in your estimates.

Death Taxes and Costs of Administration. An effort should be made to roughly approximate the potential shrinkage of assets that will be caused by the expenses of death taxes and estate administration.

Federal estate taxes would not be a factor for the size estate we have estimated would be needed in our example. It is well within the minimum $250,000 marital deduction plus the exemption equivalent (which ranges from $120,000 if death occurs in 1977 to $175,000 for deaths after 1980) of the tax credit. (As an estate grows, however, the federal levy becomes important long before the $425,000 threshold is reached.)

Most states, though, impose an inheritance tax or their own estate tax on smaller sums. How much, if anything, you should estimate for this possible expense depends initially on where you live. Because states vary so greatly, no general rule is possible. For example, there is no uniformity with respect to exemptions or credits, the valuations of various types of property interests differ, life insurance proceeds paid to a named beneficiary are exempt, in whole or in part, in about one-half the states, and in community property states, only one-half the value of community assets are taxable. But to give you some idea of costs, if a husband leaves his wife, after deductions, a $200,000 estate that includes $100,000 of life insurance proceeds, she would pay an inheritance tax of $3,000 if Colorado had been his domicile; $900, if California; $2,300, if New Jersey; or $8,700, if Tennessee.

For our immediate purpose, it probably would be sufficiently close in most cases, assuming you are from a common law state that assesses a death tax, to add 2% to the total of $133,350 we have arrived at so far. This increases the minimum need by about $2,700.

An allowance should also be made for other costs associated with transferring property from the dead to the living (e.g., attorney's fees and executor's fees). If you have a relatively small estate and have arranged it in a manner to avoid, to the extent possible, judicial intervention and supervision, the costs of administration would be negligible. However, they could be significant, depending upon a number of considerations (e.g., the nature of the property, its location in more than one state, or the complexity of the distribution plans). For an estate of the size we are dealing with, adding 5% should provide an adequate margin in most cases. Hence, include another $6,700 for this component.

Estimate the monthly income your survivors will need, assuming you were to die within the next few months.

Based upon the computations we have gone through, to provide for Irmatrude, Alpha and Omega if you were to die in the near future, the size of your estate should be at least:

Income supplement	$105,750
Indebtedness	5,000
College fund	22,600
Death taxes	2,700
Costs of Administration	6,700
TOTAL	$142,750

Don't be discouraged by what, to most young people might seem to be an unreachable goal. Life insurance programs and other investment plans might enable you to achieve your purpose much easier and less expensively than you think.

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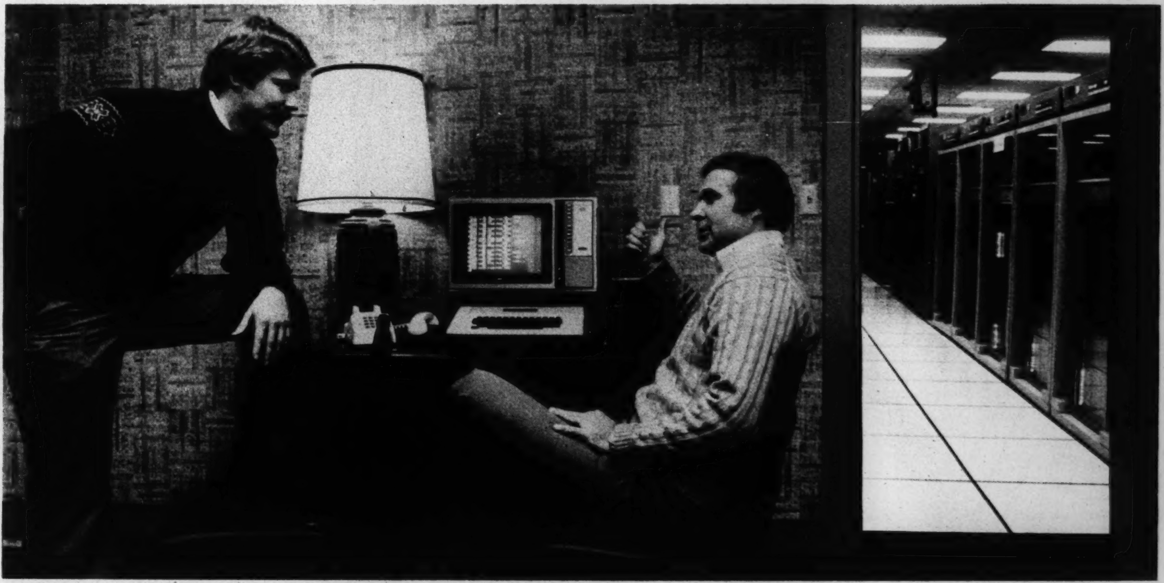


". . . but the really impressive stuff is in the back room."

CIRCLE 121 ON READER SERVICE CARD

Also remember that estate needs change constantly as a person advances in age and family responsibilities. For example, take the family situation used in the illustration and project it into the future at ten-year intervals. Also assume normal career progression and no changes in present pay tables and survivor benefit rates. Without detailing the step-by-step computations, the results would indicate that surviving dependents could be provided a monthly income equal to 75% of the military member's estimated income at the assumed future dates of death, and the children's college costs could be met, if the estate (in terms of present dollars) were about $250,000 at age 38, $200,000 at age 48, $23,000 at age 58, and that at age 68, nothing would be necessary since the survivor benefits (SBP and social security) would then exceed the 75%-of-income goal.

It is readily apparent that, standing alone, the survivors' benefits would not be adequate.

Don't take estimates of needs many years from now seriously, though: they are of little value insofar as defining actual future requirements are concerned, simply because too many unforeseeable developments are bound to distort your assumptions, and they do not reckon with the inroads of inflation. Nevertheless, such projections do serve to show, in a rough manner, the relative changes in minimum requirements over a lifespan.

Personal Estate Planning Program

Rather than using paper, pencil, calculator and arithmetic chart paper to determine what your current estate should be and then repeating the entire process when you change one of the variables, I have developed a computer program to do all of this for you. Of course you must interact with the computer and supply values for the variables. As mentioned previously closed formulas for Present Value of Annuity and Present Value are used in lieu of storing table values. The following scenario is a typical session at the terminal:

```
PERSONAL ESTATE PLANNING
PROGRAM
ENTER NUMBER OF DEPENDENT
CHILDREN THAT ARE UNDER THE
AGE OF 18?
2

YOU MUST ENTER AGE IN (YEARS)
OF YOUNGEST CHILD FIRST, . . . ,
ETC., AND AGE OF OLDEST CHILD
LAST.

AGE OF CHILD 1 IS
? 1

AGE OF CHILD 2 IS
? 4

ENTER THE AGE OF YOUR WIFE
(ROUNDED TO NEAREST YEAR) ? 26

ACCORDING TO CURRENT
MORTALITY TABLES FOR FEMALES,
YOUR WIFE WILL LIVE FOR AN
ADDITIONAL 48 YEARS. JUST TO BE
ON THE SAFE SIDE, WE WILL ADD
5 YEARS AND SAY THAT SHE HAS
AN ADDITIONAL 53 YEARS TO LIVE

AN ESTIMATE OF THE MONTHLY
INCOME YOUR SURVIVORS WILL
NEED IS

75% OF YOUR CURRENT INCOME
AFTER TAXES. FOR YOUR PARTIC-
ULAR SITUATION YOU MAY WANT
TO INCREASE OR DECREASE THIS
PLANNING ESTIMATE.

ESTIMATE OF MONTHLY INCOME
(AFTER TAXES) FOR SURVIVORS
? 1400


"A narrative display that describes
Dependency and Indemnity Compen-
sation (DIC) for active duty military
personnel"

DO YOU QUALIFY FOR DIC
(1=YES, 2=NO) ? 2

"A narrative description of survivor
benefits resulting from social security
payments"

ARE YOUR SURVIVORS ELIGIBLE
TO RECEIVE SOCIAL SECURITY
BENEFITS
(1=YES, 2=NO) ? 1

"Prints a table by year of the maximum
wages taxed for FICA"

ON A SCRATCH PAD, ANNOTATE
THE YEARLY CORRECTIONS FOR
WAGES SUBJECT TO SOCIAL
SECURITY. DON'T FORGET TO
INCLUDE WAGE CREDITS FOR
MILITARY SERVICE.

ACCORDING TO THE RULES FOR
COMPUTING THE AVERAGE
MONTHLY WAGE, YOU ARE FIRST
ASKED TO INPUT THE ACTUAL
WAGES TAXED (PER YEAR) UP TO
THE MAXIMUM IN ANY GIVEN YEAR.
IF ACTUAL WAGES IN ANY YEAR
WERE ZERO THEN ENTER A SMALL
POSITIVE NUMBER, SAY 1 (NOT
ZERO).

HOW MANY YEARLY WAGES DO
YOU WANT TO CHANGE? 0

YOUR FIRST YEAR FOR WITH-
HOLDING FICA WAS ? 1972
YOUR LAST YEAR FOR WITH-
HOLDING FICA WAS ? 1978

THE RESPECTIVE YEAR AND
WAGES TAXED ARE AS FOLLOWS:

1972:  9000      1973: 10800
1974: 13200      1975: 14100
1976: 15300      1977: 16500
1978: 17700

CALCULATIONS OF YOUR
AVERAGE MONTHLY WAGE (AMW)
FOR SOCIAL SECURITY PURPOSES
WILL NOW BE BASED ON THE
FOLLOWING YEARLY WAGE
INFORMATION.

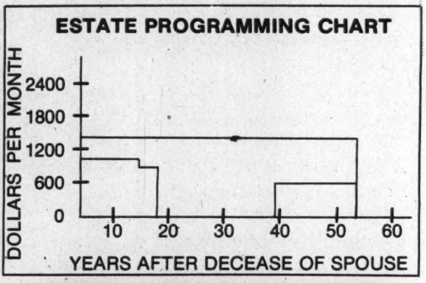
1972:      0     1973:      0
1974:      0     1975:      0
1976:      0     1977: 16500
1978: 17700

COMPUTED AMW = $1425

"Narrative display of how AMW and
number of dependents is used to
determine the primary insurance
amount (PIA) and maximum family
benefit (MFB)."

PIA = $548      MFB = $956

"Display of monthly benefits for each
year"
```



Until actually needed the estate could be invested and earnings from it used or added to principal.

```
ENTER YEARLY PERCENTAGE GAIN
ON ESTATE AFTER TAXES ? 5

ASSUMING THE ABOVE PERCENT-
AGE GAIN ON ESTATE, THE TOTAL
AMOUNT NEEDED AT WAGE
EARNERS DEATH TO FILL ALL
FUTURE GAPS FOR NORMAL DAY
TO DAY EXPENSES IS $172,875

"Narrative display of other require-
ments (e.g., outstanding indebted-
ness, college expenses, etc.)"

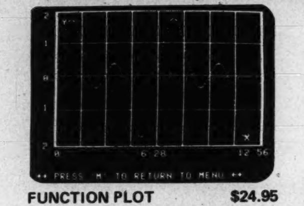
LET'S START WITHOUTSTANDING
INDEBTEDNESS

YOUR TOTAL DEBT OWED. FOR
EXAMPLE HOUSE MORTGAGE,
CAR INSURANCE, ETC ? 5000

"Narrative display on college costs"

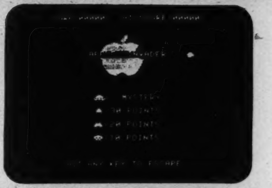
ARE YOU PLANNING TO FINANCE
YOUR CHILDREN THROUGH
COLLEGE (1=YES, 2=NO) ? 1
```

NEW APPLE II® SOFTWARE

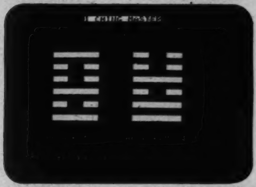


```
** PRESS 'M' TO RETURN TO MENU **
```

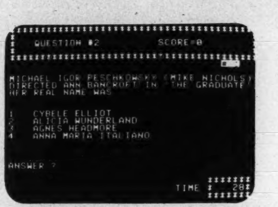
FUNCTION PLOT $24.95



APPLE INVADERS GAME



I-CHING $15.95



```
QUESTION #2             SCORE=0

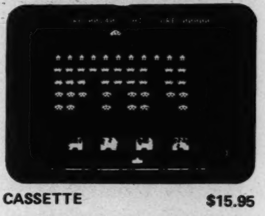
MICHAEL IGOR PESCHKOWSKY (MIKE NICHOLS)
DIRECTED ANN BANCROFT IN 'THE GRADUATE'
HER REAL NAME WAS

1   CYBELE ELLIOT
2   ALICIA WUNDERLAND
3   AGNES HEADMORE
4   ANNA MARIA ITALIANO

ANSWER ?

                                TIME   28
```

TRIVIA BOX $19.95



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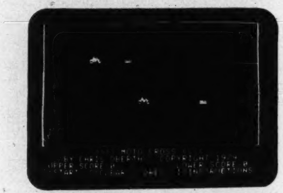

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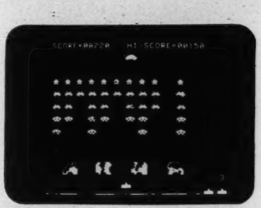

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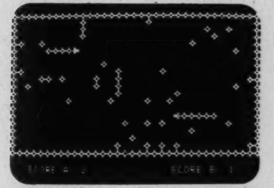

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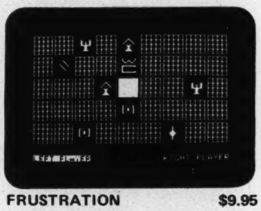

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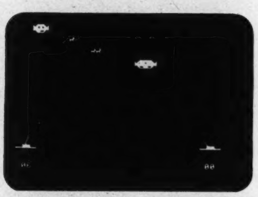

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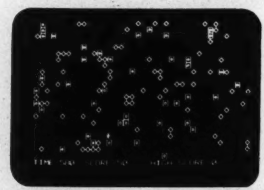

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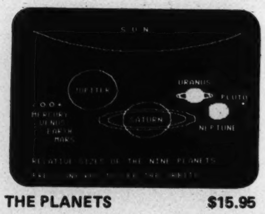

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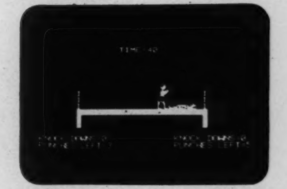

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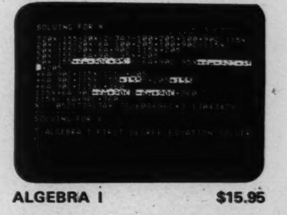

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PROGRAMMA Software Program Products

Planning, cont'd. . .

FOR CHILD 1 WHO IS 1 YEARS OLD, ENTER THE TOTAL COLLEGE EXPENSE (E.G., $18,000 OR $30,000, OR A VALUE THAT YOU FEEL IS MORE APPROPRIATE)
? 24000

YOU HAVE A REQUIREMENT OF $10,471 TODAY COMPOUNDED AT 5% YEARLY IN ORDER TO COVER HIS COLLEGE EXPENSES OF $24,000, 17 YEARS FROM NOW.

FOR CHILD 2 WHO IS 4 YEARS OLD, ENTER THE TOTAL COLLEGE EXPENSE (E.G., $18,000 OR $30,000, OR A VALUE THAT YOU FEEL IS MORE APPROPRIATE)
? 24000

YOU HAVE A REQUIREMENT OF $12,122 TODAY COMPOUNDED AT 5% YEARLY IN ORDER TO COVER HIS COLLEGE EXPENSES OF $24,000, 14 YEARS FROM NOW.

A TOTAL REQUIREMENT OF $22,593 TODAY IS REQUIRED TO SATISFY FUTURE COLLEGE COSTS.

DO YOU HAVE OTHER RESPONSIBILITIES (E.G., SUPPORT OF PARENT) (1=YES, 2=NO)
? 2

"Narrative description on federal and estate taxes. Assumes 2% for state estate tax"

YOUR ESTATE REQUIREMENT SO FAR IS $200,468. THEREFORE AN APPROXIMATION OF THE STATE INHERITANCE TAX IS $4,009

"Narrative description of attorney's (administrative) fees"

COSTS OF ADMINISTRATION IS $10,023

If invested to yield 5% compounded annually, what principal sum would be necessary at the beginning of a 14 year period, so that at the end of 14 years the principal and earnings would equal $10,000?

A SUMMARY OF YOUR ESTATE REQUIREMENTS IS AS FOLLOWS:

INCOME SUPPLEMENT	$172,875
INDEBTEDNESS	5,000
COLLEGE FUND	22,593
OTHER RESPONSIBILITIES	0
DEATH TAXES	4,009
COSTS OF ADMINISTRATION	10,023
TOTAL	$214,501

NOW THE QUESTION IS, DO YOU NEED MORE THAN YOU NOW HAVE? TO ANSWER THIS QUESTION PROCEED AS FOLLOWS:

ENTER LIFE INSURANCE
(FACE VALUE) ? 100000
SECURITIES
(PRESENT MARKET VALUE) ? 5000
SAVINGS ? 2000
REAL ESTATE
(PRESENT MARKET VALUE) ? 10000
OTHER ? 0

TOTAL ESTATE ASSETS $117,000

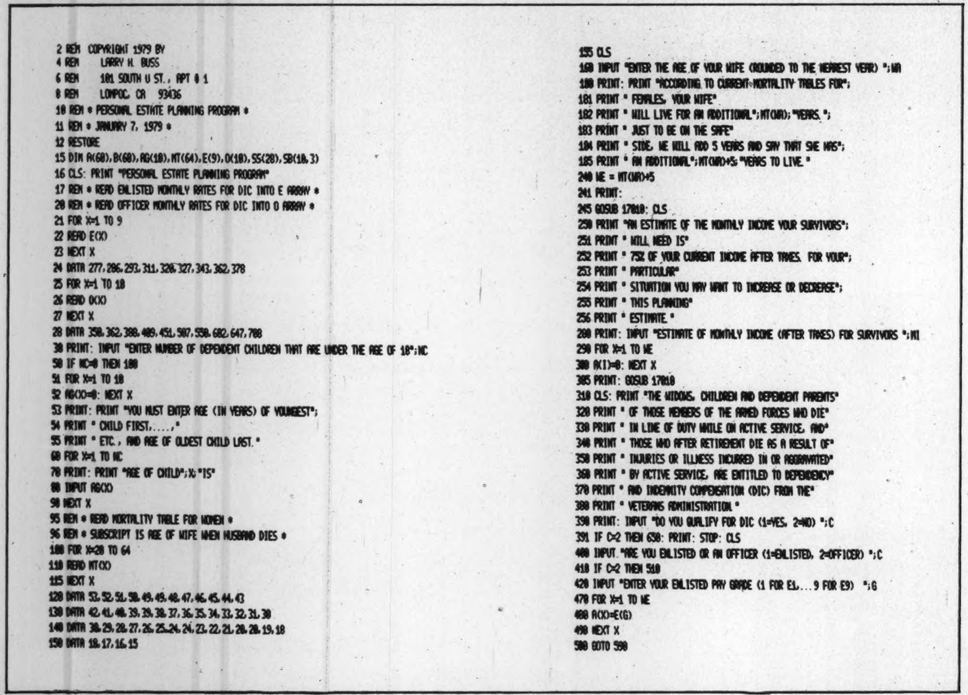
TOTAL ESTATE REQUIREMENTS $214,501

INCREASE YOUR ESTATE ASSETS BY $97,501 IN ORDER TO MEET YOUR ESTATE REQUIREMENTS.

NOTE: If we change the yearly percentage gain on estate after taxes from 5% to 8% and hold other variables constant, the total estate requirements turn out to be $128,238 rather than $214,501. Only $11,238 is needed in order to meet estate requirements.

Program Availability

You can obtain a TRS-80 cassette tape of either the 16K or 32K version of this program together with documentation for $14.95. Send your order to Larry H. Buss, 101 South U St., Apt. 1, Lompoc, CA 93436. Add an additional $4.00 for a source listing of the copyrighted program. In the near future, the program will be converted to run under CP/M in CBASIC 2. ☐



```
2 REM  COPYRIGHT 1979 BY
4 REM     LARRY H. BUSS
6 REM     101 SOUTH U ST., APT # 1
8 REM     LOMPOC, CA   93436
10 REM * PERSONAL ESTATE PLANNING PROGRAM *
11 REM * JANUARY 7, 1979 *
12 RESTORE
15 DIM A(60),B(60),AG(10),MT(64),E(9),O(10),SS(20),SB(10,3)
16 CLS: PRINT "PERSONAL ESTATE PLANNING PROGRAM"
17 REM * READ ENLISTED MONTHLY RATES FOR DIC INTO E ARRAY *
20 REM * READ OFFICER MONTHLY RATES FOR DIC INTO O ARRAY *
21 FOR X=1 TO 9
22 READ E(X)
23 NEXT X
24 DATA 277,286,293,311,320,327,343,362,378
25 FOR X=1 TO 10
26 READ O(X)
27 NEXT X
28 DATA 350,362,388,409,451,507,550,602,647,700
30 PRINT: INPUT "ENTER NUMBER OF DEPENDENT CHILDREN THAT ARE UNDER THE AGE OF 18";NC
50 IF NC=0 THEN 100
51 FOR X=1 TO 10
52 AG(X)=0: NEXT X
53 PRINT: PRINT "YOU MUST ENTER AGE (IN YEARS) OF YOUNGEST";
54 PRINT " CHILD FIRST,....,"
55 PRINT " ETC., AND AGE OF OLDEST CHILD LAST."
60 FOR X=1 TO NC
70 PRINT: PRINT "AGE OF CHILD";X;"IS"
80 INPUT AG(X)
90 NEXT X
95 REM * READ MORTALITY TABLE FOR WOMEN *
96 REM * SUBSCRIPT IS AGE OF WIFE WHEN HUSBAND DIES *
100 FOR X=20 TO 64
110 READ MT(X)
115 NEXT X
120 DATA 53,52,51,50,49,49,48,47,46,45,44,43
130 DATA 42,41,40,39,39,38,37,36,35,34,33,32,31,30
140 DATA 30,29,28,27,26,25,24,24,23,22,21,20,20,19,18
150 DATA 18,17,16,15
155 CLS
160 INPUT "ENTER THE AGE OF YOUR WIFE (ROUNDED TO THE NEAREST YEAR) ";WA
180 PRINT: PRINT "ACCORDING TO CURRENT MORTALITY TABLES FOR";
181 PRINT " FEMALES, YOUR WIFE"
182 PRINT " WILL LIVE FOR AN ADDITIONAL";MT(WA);"YEARS.";
183 PRINT " JUST TO BE ON THE SAFE"
184 PRINT " SIDE, WE WILL ADD 5 YEARS AND SAY THAT SHE HAS";
185 PRINT " AN ADDITIONAL";MT(WA)+5;"YEARS TO LIVE."
240 WE = MT(WA)+5
241 PRINT:
245 GOSUB 17010: CLS
250 PRINT "AN ESTIMATE OF THE MONTHLY INCOME YOUR SURVIVORS";
251 PRINT " WILL NEED IS"
252 PRINT " 75% OF YOUR CURRENT INCOME AFTER TAXES. FOR YOUR";
253 PRINT " PARTICULAR"
254 PRINT " SITUATION YOU MAY WANT TO INCREASE OR DECREASE";
255 PRINT " THIS PLANNING"
256 PRINT " ESTIMATE."
280 PRINT: INPUT "ESTIMATE OF MONTHLY INCOME (AFTER TAXES) FOR SURVIVORS ";MI
290 FOR X=1 TO WE
300 A(I)=0: NEXT X
305 PRINT: GOSUB 17010
310 CLS: PRINT "THE WIDOWS, CHILDREN AND DEPENDENT PARENTS"
320 PRINT " OF THOSE MEMBERS OF THE ARMED FORCES WHO DIE"
330 PRINT " IN LINE OF DUTY WHILE ON ACTIVE SERVICE, AND"
340 PRINT " THOSE WHO AFTER RETIREMENT DIE AS A RESULT OF"
350 PRINT " INJURIES OR ILLNESS INCURRED IN OR AGGRAVATED"
360 PRINT " BY ACTIVE SERVICE, ARE ENTITLED TO DEPENDENCY"
370 PRINT " AND INDEMNITY COMPENSATION (DIC) FROM THE"
380 PRINT " VETERANS ADMINISTRATION."
390 PRINT: INPUT "DO YOU QUALIFY FOR DIC (1=YES, 2=NO) ";C
391 IF C=2 THEN 630: PRINT: STOP: CLS
400 INPUT "ARE YOU ENLISTED OR AN OFFICER (1=ENLISTED, 2=OFFICER) ";C
410 IF C=2 THEN 510
420 INPUT "ENTER YOUR ENLISTED PAY GRADE (1 FOR E1...9 FOR E9)  ";G
470 FOR X=1 TO WE
480 A(X)=E(G)
490 NEXT X
500 GOTO 590
```

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TREK-X

Welcome to the most sophisticated Trek we've seen yet. We'll beam you aboard to command this mission at the helm of the Federation Starship *Enterprise*. Your briefing follows:

I. The Romulans and the Klingons, normally antagonistic to one another, have decided to form an alliance. This alliance has but one end—to annihilate the United Federation of Planets.

II. You have a dual mission: first, to explore the more distant realms of space; and second, to locate and destroy as many Romulan/Klingon warships as possible. Another ally of the Romulan/Klingon coalition may attack the *Enterprise*—you will receive further instructions.

III. After you make fifty confirmed "kills," your mission will be accomplished, and you can head home.

In Trek-X the vastness of space is depicted by a 12 x 12 x 4 matrix containing suns, planets, moons, and other celestial bodies. Unlike some two-dimensional "treks," Trek-X allows you to move in front of or behind suns, planets, and enemy spacecraft. Note also that quadrant boundaries are transparent to you, just as they would be in real life. You'll have both warp power and sub-light speeds at your disposal, and a detailed map of space will be available on demand. Your ship's computer will display the present alert condition (e.g., Green, Yellow, Red, or CRITICAL), and will keep track of your shield power and the number of hits you've received from enemy vessels.

To add even more realism, optional sound effects—phasor and photon torpedo fire, and their resultant explosions—have been included. Trek-X: more than just a game. For the 8K PET. **Order No. 0032P $7.95.**

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Designed for use on
TRS-80*
16K
LEVEL II

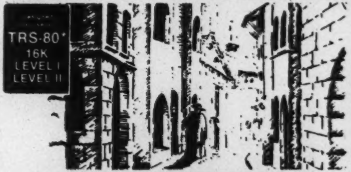
EVERY FLIGHT IS A SPECIAL DELIVERY

OK, Ace, you survived everything that von Richthofen and the Flying Circus threw at you. Well, that was four long years ago—and yesterday's medals don't pay the rent. But just a minute, here's an ad:

"Airmail Pilot wanted . . ."

AIRMAIL PILOT

You can almost smell the gasoline as the ground crew fuels your J-4 Jenny biplane to her 26-gallon limit. Precious mail is loaded into the cargo area, tagged for Chicago. The weatherman reports severe icing above 6,000 feet, so you know you have to keep the plane low. It will be a dangerous flight, but you knew that when you took the job. The mail must go through. So, in the tradition of Lindbergh and a hundred unsung heroes, you bravely turn your plane into the wind. The engine roars. Suddenly you're aloft on the first leg of your journey. Dayton's socked in by fog. You change your course for Lucasville. Lightning zigzags the sky. A massive, fast-moving thunderstorm forces you to land in a cornfield. As the weather clears, your plane leaps once more into the sky. But even clear skies can cause problems—violent air currents buffet your fragile wooden aircraft. Your fuel is down to two gallons as Lucasville comes into sight. You make it! Refuel and head for Chicago. But you're not out of trouble yet. There's a wind shear at the Chicago airport. You have to land in a shifting crosswind. Can you make it? AIRMAIL PILOT from INSTANT SOFTWARE. Unlike any other computer simulation you've ever experienced. Challenging. Difficult. But never impossible. An event in a cassette. Crash or fly, it's so realistic, you can almost feel the wind. Requires a Level II 16K. **Order No. 0108R $7.95.**



TRS-80*
16K
LEVEL I
LEVEL II

SANTA PARAVIA AND FIUMACCIO

The year is A.D. 1400, and you are the ruler of a tiny Italian city-state. You are ambitious by nature and intend to build your little city-state into a powerful kingdom.

So begins Santa Paravia and Fiumaccio, where you and your fellow players compete as rulers of neighboring cities. You control the grain harvest, feed your people, set tax rates, exercise justice, invest in public works and, of course, try to stay on the good side of the church.

Life was short back then, and you'll have only a limited amount of time in which to build your kingdom. The lives of your serfs will depend on your decisions. If you act wisely, then your city-state will grow and you will acquire loftier titles. If your rule is incompetent, your people will starve, and your city-state may be invaded by your neighbors.

You can play the game yourself or set up the tournament version, which allows up to six players at a time to compete. Either way, you're sure to find your route to the throne a challenging and rocky one.

How will you rule your kingdom? Will you be a benevolent ruler—an iron fist in a velvet glove—or will you become unscrupulous and follow the example set by Niccolo Machiavelli in his book on government, *The Prince*? Only *you* can answer that question—with Santa Paravia and Fiumaccio. **Order No. 0043R $7.95.**

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CIRCLE 144 ON READER SERVICE CARD

```
14280 INPUT V1
14290 BG = 18-AG(X)
14300 GOSUB 13010
14310 PRINT: PRINT USING "%                              %$$##.###%   %";"YOU HAVE A REQUIREMENT OF ";V2;" TODAY";
14320 PRINT " COMPOUNDED AT";I*100;"%"
14321 PRINT " YEARLY IN ORDER TO COVER HIS COLLEGE EXPENSES";
14322 PRINT USING "%  %$$##.###%%";" OF ";V1;" ."
14323 PRINT " ";BG;"YEARS FROM NOW "
14340 CE=CE+V2
14350 NEXT X
14352 PRINT: GOSUB 17010: CLS
14360 PRINT: PRINT USING "%                           %$$###.###%       %";"A TOTAL REQUIREMENT OF ";CE;" TODAY IS";
14361 PRINT " REQUIRED TO SATISFY"
14362 PRINT " FUTURE COLLEGE COSTS "
14364 GOSUB 17010: CLS
14380 PRINT: PRINT "DO YOU HAVE OTHER RESPONSIBILITIES";
14381 PRINT ", (E.G. SUPPORT OF PARENT)"
14382 PRINT " (1=YES, 2=NO)"
14383 INPUT C
14400 IF C=2 THEN 14480
14410 INPUT "ENTER AMOUNT PER YEAR FOR OTHER RESPONSIBILITIES ";VR
14430 INPUT "NUMBER OF YEARS THAT YOU EXPECT THIS TO CONTINUE";LG
14450 GOSUB 12010: OT=V1
14460 PRINT: PRINT USING "%                           %$$###.###%                             %";"A TOTAL REQUIREMENT OF ";OT;" TODAY IS REQ
UIRED TO SATISFY"
14462 PRINT " OTHER RESPONSIBILITIES "
14480 GOSUB 17010: CLS:PRINT "NOW WE WILL CALCULATE DEATH TAXES. WE WILL";
14481 PRINT " ASSUME FEDERAL"
14482 PRINT " ESTATE TAXES DO NOT COME INTO PLAY, SINCE";
14483 PRINT " THERE IS A MINIMUM"
14484 PRINT " $250,000 MARITAL DEDUCTION PLUS AN EXEMPTION";
14485 PRINT " EQUIVALENT WHICH"
14486 PRINT " RANGES FROM $120,000 TO $175,000 DEPENDING ON";
14487 PRINT " YEAR OF DEATH ": PRINT
14540 PRINT "MOST STATES IMPOSE AN INHERITANCE TAX";
14541 PRINT " OR THEIR OWN ESTATE TAX "
14542 PRINT " THIS VARIES FROM STATE TO STATE AND THEREFORE";
14543 PRINT " WE WILL ASSUME"
14544 PRINT " IT IS 2% OF YOUR ESTATE ": PRINT
14580 PRINT USING "%                                %$$###.###";"YOUR ESTATE REQUIREMENT SO FAR IS";GR+OI+CE+OT
14582 E = GR+OI+CE+OT: ST = .02*E
14588 PRINT
14600 PRINT "THEREFORE AN APPROXIMATION OF THE STATE";
14601 PRINT " INHERITANCE TAX"
14602 PRINT USING "% %$$##.###";" IS";ST
14615 PRINT: GOSUB 17010: CLS
14620 PRINT: PRINT "ADMINISTRATIVE COSTS (ATTORNEY'S FEES";
14621 PRINT " AND EXECUTOR'S FEES) MUST"
14622 PRINT " BE CONSIDERED IN TRANSFERRING PROPERTY FROM";
14623 PRINT " THE DEAD TO THE"
14624 PRINT " LIVING. ADDING 5% SHOULD PROVIDE AN ADEQUATE";
14625 PRINT " MARGIN IN MOST"
14626 PRINT " CASES."
14670 AC = .05*E
14680 PRINT: PRINT USING "%                          %$$##.###";"COSTS OF ADMINISTRATION IS";AC
14681 PRINT: GOSUB 17010: CLS
14685 E = E+ST+AC
14690 CLS: PRINT "A SUMMARY OF YOUR ESTATE REQUIREMENTS IS AS FOLLOWS:"
14710 PRINT: PRINT USING "%                          %$$###.###";"INCOME SUPPLEMENT          ";GR
14720 PRINT USING "%                         %$$###.###";"INDEBTEDNESS             ";OI
14730 PRINT USING "%                         %$$###.###";"COLLEGE FUND             ";CE
14735 PRINT USING "%                         %$$###.###";"OTHER RESPONSIBILITIES   ";OT
14740 PRINT USING "%                         %$$###.###";"DEATH TAXES              ";ST
14750 PRINT USING "%                         %$$###.###";"COSTS OF ADMINISTRATION  ";AC
14760 PRINT USING "%                         %$$###.###";"                 TOTAL   ";E
14770 PRINT: PRINT "NOW THE QUESTION IS, DO YOU NEED MORE THAN YOU NOW HAVE ?"
14790 PRINT "TO ANSWER THIS QUESTION PROCEED AS FOLLOWS:"
14791 PRINT: GOSUB 17010: CLS
14800 INPUT "ENTER LIFE INSURANCE (FACE VALUE)";LI
14810 INPUT "SECURITIES (PRESENT MARKET VALUE)";SE
14820 INPUT "SAVINGS";SA
14830 INPUT "REAL ESTATE (PRESENT MARKET VALUE)";RE
14840 INPUT "OTHER";O
14850 EA = LI+SE+SA+RE+O
14860 PRINT: PRINT USING "%                   %$$###.###";"TOTAL ESTATE ASSETS ";EA
14870 PRINT: PRINT USING "%                        %$$###.###";"TOTAL ESTATE REQUIREMENTS ";E
14880 IF EA >= E THEN 14920
14890 PRINT: PRINT USING "%                          %$$###.###%                    %";"INCREASE YOUR ESTATE ASSETS BY ";E-EA;" I
N ORDER TO MEET YOUR"
14900 PRINT " ESTATE REQUIREMENTS "
14910 GOTO 14940
14920 PRINT: PRINT USING "%                                                   %$$###.###";"YOUR ESTATE ASSETS EXCEED YOUR REQUIREME
NTS BY ";EA-E
14940 PRINT: RETURN: END
15000 REM * SUBROUTINE TO COMPLETE MONTHLY SS BENEFITS *
15010 IF V2-V1+1 < 7 THEN 15030
15020 NW = (V2-V1+1)-5: N2=5: GOTO 15040
15030 NW=2: N2=(V2-V1+1)-2
15040 FOR X=1 TO N2
15050 FOR Y = V1-1950 TO V2-1950
15060 IF SS(Y)=0 THEN 15080
15070 TW=SS(Y): TL=Y: Y=V2-1950: GOTO 15080
15080 NEXT Y
15090 FOR Y=TL+1 TO V2-1950
15100 IF SS(Y)=0 THEN 15130
15110 IF SS(Y) >= TW THEN 15130
15120 TW=SS(Y): TL=Y
15130 NEXT Y
15140 SS(TL)=0
```

SAVINGS ACCOUNT

```
15150 NEXT X
15159 PRINT "CALCULATION OF YOUR AVERAGE MONTHLY WAGE (AMW) FOR"
15160 PRINT " SOCIAL SECURITY PURPOSES WILL NOW BE BASED ON THE"
15161 PRINT " FOLLOWING YEARLY WAGE INFORMATION:"
15162 PRINT
15170 FOR X = V1-1950 TO V2-1950
15180 PRINT X+1950;SS(X),
15190 NEXT X
15192 PRINT
15200 AMW=0
15210 FOR X = V1-1950 TO V2-1950
15220 AMW=AMW+SS(X)
15230 NEXT X
15240 AMW=AMW/(12*NW)
15250 PRINT: PRINT USING "%                %$$###";"COMPUTED AMW =";AMW
15255 GOSUB 17010: CLS
15260 FOR X=1 TO 10
15270 FOR Y=1 TO 3
15280 READ SB(X,Y)
15282 NEXT Y
15284 NEXT X
15290 DATA 100,146,220,200,209,313,300,262,420
15300 DATA 400,315,575,500,363,669,600,418,744
15310 DATA 700,464,811,800,493,862,900,520,910
15320 DATA 1000,548,956
15330 IF NC>0 THEN 15380
15340 CLS: PRINT "YOU HAVE ALREADY TOLD ME THAT YOU"
15341 PRINT " HAVE NO DEPENDENT CHILDREN UNDER THE AGE OF"
15342 PRINT " 18. AT THIS POINT I WILL COMPUTE THE MONTHLY"
15343 PRINT " TAX-FREE SOCIAL SECURITY STIPEND YOUR WIFE"
15344 PRINT " WILL START RECEIVING AT THE AGE OF 65 AND"
15345 PRINT " UPDATE THE BENEFITS ARRAY "
15347 GOSUB 17010: CLS
15350 GOSUB 16001
15360 PRINT: PRINT "THE MONTHLY SS BENEFIT YOUR WIFE WILL"
15361 PRINT " START RECEIVING AT AGE 65 IS $";PIA
15370 GOTO 15510
15380 IF NC >= 2 THEN 15440
15390 GOSUB 16001
15400 FOR X=1 TO 18-AG(1)
15410 A(X)=A(X)+1.5*PIA
15420 NEXT X
15430 GOTO 15510
15440 GOSUB 16001
15450 FOR X=1 TO 18-AG(2)
15460 A(X)=A(X)+MFB
15470 NEXT X
15480 FOR X = 18-AG(2)+1 TO 18-AG(1)
15490 A(X)=A(X)+1.5*PIA
15500 NEXT X
15510 FOR X=65-WA TO WE
15520 A(X)=A(X)+PIA
15530 NEXT X
15540 PRINT "THE FINAL MONTHLY BENEFITS FOR EACH YEAR ARE AS FOLLOWS:": PRINT
15550 FOR X=1 TO WE
15560 PRINT X;A(X),
15562 IF X <> 32 THEN 15570
15564 PRINT: PRINT "TO BE CONTINUED"
15566 PRINT: GOSUB 17010: CLS
15570 NEXT X
15580 GOSUB 17010: CLS
15590 RETURN: END
16000 REM * SUBROUTINE THAT CALCULATES PIA *
16001 IF AMW >= 100 AND AMW <= 1000 THEN 16010
16002 IF AMW > 1000 THEN 16005
16003 PRINT "AVERAGE MONTHLY WAGE IS TO LOW TO SET SS"
16004 PIA=0: MFB=0: GOTO 16082
16005 PRINT "AVERAGE MONTHLY WAGE IS ABOVE MAXIMUM"
16006 PIA = SB(10,2): MFB = SB(10,3): GOTO 16082
16010 FOR X=1 TO 10
16020 IF AMW > SB(X,1) THEN 16070
16030 T1 = (AMW-SB(X-1,1))/100
16040 T2 = SB(X,2)-SB (X-1,2)
16050 T3 = SB(X-1,2)
16051 T4=SB(X,3)-SB(X-1,3)
16052 T5=SB(X-1,3)
16060 X=10
16070 NEXT X
16080 PIA = T3+T1*T2
16081 MFB=T5+T1*T4
16082 PRINT "ONCE THE AMW IS KNOWN, THE PRIMARY INSURANCE AMOUNT (PIA)"
16084 PRINT " CAN BE DETERMINED.  ALL BENEFITS ARE IN MULTIPLES OF THE"
16086 PRINT " PIA.  WHEN A WORKER IS SURVIVED BY AN ELGIBLE WIDOW AND"
16088 PRINT " A DEPENDENT CHILD OR CHILDREN ALONE, THE MONTHLY BENEFIT"
16090 PRINT " IS THREE-FOURTHS THE PIA TIMES THE NUMBER OF ELGIBLE"
16092 PRINT " SURVIVORS, UP TO THE MAXIMUM FAMILY BENEFIT (MFB) FOR"
16094 PRINT " HIS AMW.  AND BECAUSE THE MFB FOR ANY AMW IS LESS THAN"
16096 PRINT " 2.25 TIMES THE PIA, ONLY THE MFB IS PAYABLE WHEN THERE"
16098 PRINT " ARE THREE OR MORE ELIGIBLE SURVIVORS "
16100 PRINT: PRINT USING "%   %$$###%      %$$###";"PIA =";PIA;"   MFB =";MFB
16102 IF NC>0 THEN 16109
16103 GOSUB 17010: CLS
16104 PRINT: PRINT "SINCE YOU HAVE NO DEPENDENTS UNDER THE AGE OF 18, YOUR WIFE"
16106 PRINT " WILL RECEIVE THE PIA AMOUNT OF $";PIA;"STARTING AT AGE 65 "
16108 PRINT " A REDUCED BENEFIT IS AVAILABLE FOR HER STARTING AT AGE 60 "
16109 GOSUB 17010: CLS
16110 RETURN: END
17000 REM * SUBROUTINE TO CHANGE A PAGE ON MONITOR *
17010 PRINT@960, "PRESS ENTER TO CONTINUE";: INPUT I$: RETURN: END
```

THE UNITED STATES OF AM
12
L
L17366793F
12
1
1
ONE DOLLAR

LIBERTY
IN GOD WE TRUST

```
510 INPUT "ENTER YOUR OFFICER PAY GRADE (1 FOR O1,   10 FOR O10) ";G
560 FOR X=1 TO WE
570 A(X)=O(G)
580 NEXT X
590 FOR X=1 TO NC
600 T=19-A(X)
610 FOR Y=1 TO T
620 A(Y)=A(Y)+33
630 NEXT Y
640 NEXT X
641 PRINT "I HAVE UPDATED YOUR MONTHLY BENEFITS AS A RESULT";
642 PRINT " OF DIC "
643 PRINT: GOSUB 17010
650 CLS: PRINT "THE FEDERAL INSURANCE CONTRIBUTIONS ACT ";
651 PRINT "(FICA), WHICH IS"
652 PRINT " COMMONLY REFERRED TO AS SOCIAL SECURITY,";
653 PRINT " ENCOMPASSES A WIDE"
654 PRINT " VARIETY OF WELFARE PROGRAMS. WHEN AN ELIGIBLE";
655 PRINT " PARTICIPANT"
656 PRINT " DIES SURVIVED BY A WIDOW OR A DEPENDENT CHILD, OR";
657 PRINT " BOTH, HIS"
658 PRINT " SURVIVORS MAY BE ENTITLED TO A MONTHLY TAX-FREE";
659 PRINT " STIPEND KEYED"
660 PRINT " TO HIS AVERAGE MONTHLY WAGE (AMW)  IN BRIEF, THE";
661 PRINT " AMW USUALLY"
662 PRINT " IS DETERMINED BY AVERAGING THE ANNUAL INCOME ON";
663 PRINT " WHICH FICA"
664 PRINT " TAXES HAVE BEEN PAID AFTER 1950 OR AFTER 1";
665 PRINT " JANUARY OF THE"
666 PRINT " YEAR IN WHICH THE PARTICIPANT BECAME 22,";
667 PRINT " WHICHEVER IS LATER,"
668 PRINT " THROUGH THE END OF THE YEAR PRECEEDING DEATH OR";
669 PRINT " AGE 62. ALL"
670 PRINT " YEARS IN THE PERIOD MUST BE CONSIDERED";
671 PRINT " IRRESPECTIVE OF"
672 PRINT " WHETHER THERE WERE ANY EARNINGS, BUT UP TO";
673 PRINT " 5 YEARS OF THE"
674 PRINT " LOWEST OR NO EARNINGS MAY BE DROPPED OUT "
695 GOSUB 17010
820 CLS: INPUT "ARE YOUR SURVIVORS ELIGIBLE TO RECEIVE SOCIAL SECURITY BENEFITS (1=YES, 2=NO) ";C
822 CLS
830 IF C=2 THEN 1110
832 REM * MAXIMUM WAGES TAXED FOR SOCIAL SECURITY STARTING *
834 REM * WITH THE YEAR 1951 ARE READ INTO THE ARRAY SS *
840 FOR X=1 TO 28
850 READ SS(X)
860 NEXT X
870 DATA 3600,3600,3600,3600,4200,4200,4200,4200,4800
880 DATA 4800,4800,4800,4800,4800,4800,6600,6600,7800
890 DATA 7800,7800,7800,9000,10800,13200,14100,15300
900 DATA 16500,17700
910 PRINT: PRINT "THE RESPECTIVE YEAR AND MAXIMUM WAGES"
920 PRINT " TAXED FOR FICA ARE AS FOLLOWS:"
930 FOR X=1 TO 28
940 PRINT 1950+X;SS(X),
950 NEXT X
952 PRINT
954 PRINT "ON A SCRATCH PAD, ANNOTATE THE YEARLY CORRECTIONS FOR WAGES"
956 PRINT " SUBJECT TO SOCIAL SECURITY  DON'T FORGET TO INCLUDE WAGE"
957 PRINT " CREDITS FOR MILITARY SERVICE "
958 GOSUB 17010: CLS
960 PRINT: PRINT "ACCORDING TO THE RULES FOR COMPUTING THE"
970 PRINT " AMW, YOU ARE FIRST ASKED TO INPUT THE ACTUAL"
980 PRINT " WAGES TAXED (PER YEAR) UP TO THE MAXIMUM IN ANY"
981 PRINT " GIVEN YEAR   IF ACTUAL WAGES IN ANY YEAR WERE ZERO"
982 PRINT " THEN ENTER A SMALL POSITIVE NUMBER, SAY 1 (NOT ZERO) "
983 PRINT
990 INPUT "HOW MANY YEARLY WAGES DO YOU WANT TO CHANGE";C
991 IF C=0 THEN 1050
1000 FOR X=1 TO C
1010 INPUT "YEAR =";YR
1020 INPUT "WAGES TAXED =";WT
1030 SS(YR-1950) = WT
1040 NEXT X
1050 CLS: INPUT "YOUR FIRST YEAR FOR WITHHOLDING FICA WAS";Y1
1055 INPUT "YOUR LAST YEAR FOR WITHHOLDING FICA WAS";Y2
1060 PRINT: PRINT "THE RESPECTIVE YEAR AND WAGES TAXED ARE AS FOLLOWS:"
1070 FOR X = Y1-1950 TO Y2-1950
1080 PRINT X+1950; SS(X),
1090 NEXT X
1095 PRINT: GOSUB 17010: CLS
1097 REM * SUBROUTINE 15000 COMPLETES MONTHLY SOCIAL
1098 REM   SECURITY BENEFITS *
1100 GOSUB 15010
1105 REM * SUBROUTINE 10000 DRAWS THE ESTATE PROGRAMMING
1106 REM   CHART *
1110 GOSUB 10010: CLS
1115 REM * SUBROUTINE 11000 DETERMINES PRESENT VALUE OF ALL
1116 REM   FUTURE GAP REQUIREMENTS *
1120 GOSUB 11005
1125 REM * SUBROUTINE 14000 CALCULATES OTHER ESTATE
1126 REM   REQUIREMENTS AND ESTATE ASSETS *
1130 GOSUB 14010
1140 END
10000 REM * SUBROUTINE THAT DRAWS THE ESTATE PROGRAMMING CHART *
10010 FOR YR=1 TO WE
10020 B(YR)=INT(A(YR)/100+.5): NEXT YR
10030 R=INT(MI/100+.5)
10040 CLS
```

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10050 PRINT @ 20, "ESTATE PROGRAMMING CHART"
10051 PRINT @ 128, "DOLLARS";
10052 PRINT @ 258, "PER";
10053 PRINT @ 385, "MONTH";
10060 FOR X=32 TO 92
10070 SET(X,32): NEXT X
10080 FOR X=32 TO 92 STEP 10
10090 SET(X,33): NEXT X
10140 PRINT @ 720, "0    10   20   30   40   50   60"
10145 FOR X=42 TO 92 STEP 10
10146 SET(X,31): NEXT X
10150 PRINT @ 138, "2400"
10160 PRINT @ 266, "1800"
10170 PRINT @ 394, "1200"
10180 PRINT @ 523, "600"
10230 PRINT @ 786, "YEARS AFTER DECEASE OF SPOUCE";
10231 FOR Y=6 TO 31
10232 SET(32,Y): NEXT Y
10233 FOR Y=7 TO 26 STEP 6
10234 SET(31,Y): NEXT Y
10235 T=31-R
10240 FOR X=33 TO WE+32
10250 SET(X,T): SET(X,31-B(X-32)): NEXT X
10280 CT=1
10290 FOR YR=1 TO WE-1
10300 IF B(YR)=B(YR+1) THEN 10370
10310 T=32+CT
10320 IF B(YR) < B(YR+1) THEN 10350
10330 FOR Y = 31-B(YR) TO 31-B(YR+1)
10340 SET(T,Y): NEXT Y: GOTO 10370
10350 FOR Y = 31-B(YR+1) TO 31-B(YR)
10360 SET(T,Y): NEXT Y
10370 CT=CT+1: NEXT YR
10380 FOR Y = 31-R TO 31
10390 SET(WE+32,Y): NEXT Y
10395 GOSUB 17010
10400 RETURN: END
11000 REM * SUBROUTINE THAT DETERMINES PRESENT VALUE OF
11001 REM    ALL FUTURE GAP REQUIREMENTS *
11005 INPUT "ENTER YEARLY PERCENTAGE GAIN ON ESTATE AFTER TAXES ";PG
11010 I=PG/100: BG=0: LG=1: GR=0
11020 FOR Y=1 TO WE-1
11030 IF A(Y) = A(Y+1) THEN 11120
11040 YR = 12*(MI-A(Y))
11050 GOSUB 12000
11070 GOSUB 13000
11090 BG = BG+LG
11100 GR = GR+V2
11110 LG = 0
11120 LG = LG+1
11130 NEXT Y
11140 YR = 12*(MI-A(WE))
11150 GOSUB 12000
11170 GOSUB 13000
11190 GR = GR+V2
11200 PRINT: PRINT "ASSUMING THE ABOVE PERCENTAGE GAIN ON ESTATE, THE TOTAL AMOUNT"
11202 PRINT " NEEDED AT WAGE EARNERS DEATH TO FILL ALL FUTURE GAPS FOR"
11204 PRINT USING "%                          %$$###,###";" NORMAL DAY TO DAY EXPENSES IS ";GR
11210 PRINT: GOSUB 17010: RETURN: END
12000 REM * SUBROUTINE THAT CALCULATES PRESENT VALUE OF ANNUITY
12002 IF YR > 0 THEN 12010
12004 V1=0: RETURN
12010 V1 = YR*(1-(1+I)[(-LG))/I
12030 RETURN: END
13000 REM * SUBROUTINE THAT CALCULATES PRESENT VALUE *
13002 IF V1 <> 0 THEN 13010
13004 V2=0: RETURN
13010 V2 = V1*(1+I)[(-BG)
13030 RETURN: END
14000 REM * SUBROUTINE THAT CALCULATES OTHER ESTATE REQUIREMENTS AND ESTATE ASSETS *
14010 CLS: PRINT "UP TO THIS POINT THE PROGRAM WITH YOUR HELP"
14020 PRINT "   HAS CALCULATED THE SIZE OF AN ESTATE THAT WILL"
14030 PRINT "   PROVIDE YOUR FAMILY WITH A MONTHLY INCOME TO"
14040 PRINT "   PROVIDE FOR NORMAL DAY TO DAY EXPENSES. NOW"
14050 PRINT "   THE PROGRAM WITH YOUR ASSISTANCE WILL"
14060 PRINT "   DETERMINE THE OTHER REQUIREMENTS THAT YOU"
14070 PRINT "   HAVE  FOR EXAMPLE, OUTSTANDING INDEBTEDNESS,"
14080 PRINT "   COLLEGE EXPENSES, OTHER RESPONSIBILITIES"
14090 PRINT "   (E.G. SUPPORT OF PARENTS, DEATH TAXES, AND"
14100 PRINT "   ADMINISTRATIVE COSTS) ": PRINT: GOSUB 17010: CLS
14120 PRINT "LET'S START WITH OUTSTANDING INDEBTEDNESS"
14130 PRINT: INPUT "YOUR TOTAL DEBT OWED  FOR EXAMPLE HOUSE MORTGAGE, CAR INSURANCE, ETC";OI
14140 GOSUB 17010: CLS
14150 PRINT "YOU HAVE ALREADY TOLD ME THAT YOU HAVE ";NC
14160 PRINT " CHILDREN AND WHAT THEIR AGES ARE  AT TODAYS"
14170 PRINT " COSTS, IT TAKES A TOTAL OF $18,000 AT A STATE"
14180 PRINT " COLLEGE OR UNIVERSITY AND $30,000 AT A PRIVATE"
14190 PRINT " SCHOOL "
14200 IF NC=0 THEN 14300
14210 PRINT: INPUT "ARE YOU PLANNING TO FINANCE YOUR CHILDREN THROUGH COLLEGE (1=YES, 2=NO)";C
14230 IF C=2 THEN 14300
14235 CE=0
14240 FOR X=1 TO NC
14242 GOSUB 17010: CLS
14250 PRINT "FOR CHILD";X;"WHO IS NOW";AG(X);"YEARS";
14251 PRINT " OLD, ENTER THE TOTAL COLLEGE"
14252 PRINT " EXPENSE (E.G. $18,000 OR $30,000, OR A VALUE";
14253 PRINT " THAT YOU FEEL"
14254 PRINT " IS MORE APPROPRIATE)"
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Important Lessons You Can Learn From Estimating Your Federal Income Taxes

W. A. Tinsley

Taxpayers are being forced into higher income tax brackets as a consequence of inflating prices and incomes. The federal income tax tables are a series of steps. As a taxpayer's income rises to another step, federal taxes take an increasing amount of the income above that step. This is called a "progressive" tax. As your income progresses, the government's share of that income increases. The tax rate structure automatically establishes the government as a growth industry. Not all taxpayers understand this process.

This computer program is useful in helping estimate how many after-tax dollars you really have left to spend, a shocking figure for many persons these days.

The most obvious use of this program is to help estimate whether or not you are likely to have a federal tax refund at the end of the year or whether, instead, you will be due to pay more federal taxes. If so, the program will suggest the amount that needs to be withheld each remaining paycheck in order to meet your tax liability. These estimates will be fairly accurate for salaried taxpayers. Taxpayers who have income subject to such things as capital gains, loss carryovers and income averaging will have less accurate estimates.

A second use of the program is to estimate the effect of a second income in the family. This income might be from a "moonlight" job, or it may come from a wife working outside the home. To better measure the after-tax dollars added by the income, run the computer program twice; once with only one income and once with both incomes. How much greater are the total taxes with the second income? Subtract those taxes from the gross income provided by the second job. This provides an estimate of the additional dollars available after taxes. Also subtract extra costs of the job, such as transportation, household help, retirement deductions, child care, etc., to estimate the net dollars added by the job.

There are other interesting estimates that can be made with the computer program. Married people often wish to find out whether it would pay to file separate returns rather than a joint return. Run the program both ways to see. Be sure you keep in mind

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1979 FEDERAL INCOME TAX ESTIMATE

Purpose-- To estimate federal taxes and compare current withholding rates with the total estimated tax liability. The user should then have a better idea as to whether a refund will be due or whether the withholding amounts should be increased. Fill in the applicable boxes below to provide the information needed for your estimates.

Needed Information:

	$	$		$	$
1 1 = Single 2 = Head of Household 3 = Married - Joint 4 = Married - Separate	2 Total Income To Date	3 Withholding To Date	4 Number of Remaining Paychecks This Year	5 Gross Pay For Each Remaining Paycheck	6 Amount Withheld From Each Remaining Paycheck

$		$	$
7 Estimated Year's Total Itemized Deductions If You Itemize	8 Total Number of Tax Exemptions for the Family	9 Total Adjustments to Income: Moving Expense, Employee Business Expenses Payments to IRA and Keogh, Alimony Paid and Interest Penalty due to Early Withdrawal of Savings.	10 Total Credits: Child Care Investment Credit, Energy Credit, New Job Credit, etc. (See "Credit" Section of Form 1040)

Other Income Sources

Income To Date	Amount Withheld To Date	No. of Remaining Paychecks This Year	Gross Check for Each Remaining Paycheck	Amount Withheld for Each Remaining Paycheck
$	$		$	$

Note: Some of the income above may be subject to Self-Employment taxes. A husband and wife might each have self-employment income. If so, reenter the total income subject to self-employment tax.

First Person's Total Self-Employment Income $____________

Second Person's Total Self-Employment Income $____________

Lessons, cont'd...

the IRS requirements about itemized deductions when making both comparisons.

Some people are curious about the tax liability two single persons would have as compared with a married couple filing a joint return. Run the program both ways. Another useful comparison for the about-to-be divorced is to compare tax liabilities under married filing a joint return and single with possibly alimony deductions.

There are some other important points to understand while using this program. Computer results estimate the taxpayer's top tax bracket. This result is stated as the number of cents out of an additional dollar of income that would go for federal tax. However, if that dollar were a dollar of long-term capital gain income, the tax is reduced 60%. This is an important fact as inflation pushes taxpayers into higher tax brackets. The computer result prints the long term capital gain rate as well as the ordinary income rate. You may be inspired to look for long term capital gain investments.

This computer program should also make you more aware of the effect of "government approved spending." The computer results mentioned how many cents out of the next dollar added to income would go to taxes. However, if that dollar were spent for an item that Congress has decided should go untaxed, the government foregoes the tax and, in effect, subsidizes that expenditure by an amount equal to the top tax bracket for your income level. Government approved spending items are listed on Schedule A, Form 1040, and under the "Adjustments to Income" section on Form 1040. If a taxpayer has enough expenditures to itemize, you can see by understanding Schedule A that Congress believes it is more important that some of your income dollars go for such things as interest, property taxes, gifts to qualifying charities and medical expenses, rather than to federal taxes. Uncle Sam is in the insurance business, too. If you have a large casualty loss or if you have large uninsured medical expenses, the government will help by letting dollars spent on those items go untaxed. Again, how much federal subsidy is involved depends upon your top tax brackets. An estimate of your top bracket is provided as a computer program result. The government also subsidizes certain business expenses, moving expenses and alimony payments. Check the "Adjustments to Income" section of 1040 for more detail.

Tax credits are important features of federal taxes that should be well understood by taxpayers. Credits are very important in that a dollar of credit offsets a dollar of tax due. There are credits for child care, certain business investments, energy conservation and an "earned income credit" for low-income taxpayers. The computer estimates the earned income credit, if applicable.

Investment credit for an item such as an automobile used for business purposes offers important tax advantages. Not only can the taxpayer depreciate the cost of the auto, but a tax credit of up to 10% of the auto cost is also available for the tax year in which the car was purchased. It is a double benefit, an immediate tax offset or refund of up to 10% plus tax deductions of the purchase cost spread over the life of the auto. Again, these are important ideas taxpayers should understand while trying to keep as much of their pay raises as possible. It may be much better to spend those raises for items Congress feels are important and, hence, tax exempt.

This computer program should encourage users to better understand the definitions and tax effects of the information needed to run it. Inflation has made income tax a significant item in all our lives. It will pay you to know more about your taxes. Using this program is a good first step. □

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10 DIMS(32),U(30),XM(30),XC(30),D(10),B(5)
20 DATA2300,.14,3400,.16,4400,.18,6500,.19,8500,.21
30 DATA10800,.24,12900,.26,15000,.3,18200,.34,23500
40 DATA.39,28800,.44,34100,.49,41500,.55,55300,.63,81800,.68,108300,.7
60 DATA2300,.14,4400,.16,6500,.18,8700,.22,11800,.24
70 DATA15000,.26,18200,.31,23500,.36,28800,.42,34100
80 DATA.46,44700,.54,60600,.59,81800,.63,108300,.68,161300,.7
100 DATA3400,.14,5500,.16,7600,.18,11900,.21,16000,.24
110 DATA20200,.28,24600,.32,29900,.37,35200,.43,45800
120 DATA.49,60000,.54,85600,.59,109400,.64,162400,.68,215400,.7
140 INPUT"ENTER TAX INFORMATION SEPARATED BY COMMAS";D(1),D(2),D(3),D(4),D(5),D(6),D(7),D(8),D(9),D(10)
145 IFD(1)>4PRINT"ERROR IN TYPE-OF-RETURN  FIGURE":GOTO 140
150 INPUT"IS DATA OK (Y OR N)";AN$:IFAN$="N"ORAN$="NO"GOTO 140
160 INPUT"IS THERE OTHER INCOME (Y OR  N)";AN$:IFAN$="N"ORAN$="NO"GOTO200
170 INPUT"ENTER OTHER INCOME FIGURES";B(1),B(2),B(3),B(4),B(5)
180 INPUT"IS DATA OK (Y OR N)";AN$:IFAN$="N"ORAN$="NO"GOTO170
190 GI=GI+B(1)+(B(3)*B(4)):TW=TW+B(2)+(B(3)*B(5)):GOTO160
200 GI=GI+D(2)+(D(4)*D(5)):TW=TW+D(3)+(D(4)*D(6)):GT=GI:GZ=GI-D(9)
210 FORI=1TO32:READS(I):NEXTI:FORI=1TO30:READU(I):NEXTI
220 FORI=1TO30:READXM(I):NEXTI
230 IFD(1)=1THENDE=2300ELSEIFD(1)=2THENDE=2300
240 IFD(1)=3THENDE=3400ELSEIFD(1)=4THENDE=1700
250 X=D(7)-DE:IFX<0THENX=0
260 GI=GI-X-D(9)-(D(8)*1000)
460 IT=D(1):ONITGOTO470,500,530,530
470 IFGI<S(1)THENTX=0:BR=0:GOTO580
480 FORI=1TO29STEP2:J=I+1:II=I+2:BR=S(J)*100
490 IFS(II)>GITHENTX=TX+((GI-S(I))*S(J))
495 IFS(II)>GIGOTO580ELSETX=TX+(S(J)*(S(II)-S(I)))
498 NEXTI:TX=TX+((GI-108300)*.7):BR=70:GOTO580
500 IFGI<U(1)THENTX=0:BR=0:GOTO580
505 FORI=1TO27STEP2:J=I+1:II=I+2:BR=U(J)*100
510 IFU(II)>GITHENTX=TX+((GI-U(I))*U(J))
515 IFU(II)>GITHENGOTO580ELSETX=TX+(U(J)*(U(II)-U(I))):NEXTI
525 TX=TX+((GI-161300)*.7):BR=70:GOTO 580
530 FORI=1TO29STEP2:J=I+1:XC(I)=XM(I):IFD(1)=4THENXC(I)=XC(I)/2
535 XC(J)=XM(J):NEXTI:IFGI<XC(1)THENTX=0:BR=0:GOTO580
552 FORI=1TO27STEP2:J=I+1:II=I+2:BR=XC(J)*100
555 IFXC(II)>GITHENTX=TX+((GI-XC(I))*XC(J))
560 IFXC(II)>GIGOTO580ELSETX=TX+(XC(J)*(XC(II)-XC(I))):NEXTI
565 BR=70
570 IFD(1)=3THENTX=TX+((GI-215400)*.7)ELSETX=TX+((GI-107700)*.7)
580 INPUT"DO YOU HAVE INCOME SUBJECT TO SELF EMPLOYMENT TAX (Y OR N)";AN$
581 CLS:IF AN$="N"ORAN$="NO"GOTO 590
582 INPUT"ARE ONE OR TWO PERSONS SELF-EMPLOYED (1 OR 2)";Z
583 INPUT"ENTER ALL SELF EMPLOYMENT INCOME FOR THE 1ST PERSON";S1
584 SS=S1*.081:IFSS>1854.9THENSS=1854.9
585 PRINT"SELF EMPLOYMENT TAX IS $";SS:TX=TX+SS:IFZ=1GOTO590
586 INPUT"ENTER ALL SELF EMPLOYMENT INCOME FOR THE 2ND PERSON";S2:ZZ=S2*.081:IFZZ>1854.9THENZZ=1854.9
587  PRINT"SELF  EMPLOYMENT TAX IS $";ZZ:TX=TX+ZZ
590 PRINT"YOUR  ESTIMATED TOTAL TAX IS  $";TX;"BASED  ON  AN INCOME OF $";GT
595 PRINT"ESTIMATED  TOTAL WITHHOLDING IS $";TW
600 PRINT"YOUR ESTIMATED TAX CREDIT IS $";D(10):AT=TX-D(10)-TW:AV=(TX/GT)*100
610 IFTX>0PRINT"YOUR AVERAGE TAX IS ";AV;"%";"OF YOUR TOTAL INCOME"
615 IFTX>0PRINT"HOWEVER, IF YOU ADD ANOTHER DOLLAR TO YOUR INCOME, YOUR TAX IS ";BR;"CENTS, UNLESS THE INCOME IS LONG
   TERM CAPITAL GAIN INCOME"
617 RB=BR*.4:PRINT"IN THAT CASE THE AMOUNT IS ";RB;" CENTS"
620 IFAT<0PRINT"YOUR ESTIMATED REFUND IS $";ABS(AT):GOTO670
640 PRINT"THE ADDITIONAL TAX DUE IS $";AT
650 IFD(4)>0THENP=AT/D(4):PRINT"IF YOU HAVE ";D(4);" MORE PAYDAYS YOU NEED TO WITHHOLD $";P;CHR$(13);"MORE DOLLARS PER
   PAY PERIOD"
670 IFGZ>0ANDGZ<10000THENEI=GZ*.1:IFGZ>5000ANDGZ<10000THENEI=500-((GZ-5000)*.1)
675 IFGZ<0ORGZ>10000GOTO999
680 PRINT"YOU MAY BE ELIGIBLE FOR AN EARNED INCOME CREDIT OF $";EI
690 AT=AT-EI:IFAT<0PRINT"IF ELIBIBLE, YOUR REFUND WILL BE $";ABS(AT)
700 IFAT>0PRINT"IF ELIGIBLE, YOU NEED TO WITHHOLD A TOTAL OF $";AT
999 END
```

Adventures In Investing: Stock Tracking Programs

William K. Mason

Stock trading, dividends and interest have been my main source of income for the last six years. I'm not broke but I haven't made a million either. When personal computers first began to appear I had a vague idea they might help me in picking stocks... but they were kits. The thing I solder best is my left forefinger, so I waited. In due course little computers proliferated like rabbits and I got my feet wet with a 4K, level I TRS-80. My subsequent career in investing by computer can be divided into three parts. First, the time of grandiose fantasy; second, the time of deepening cynicism; and third the time of healthy realism.

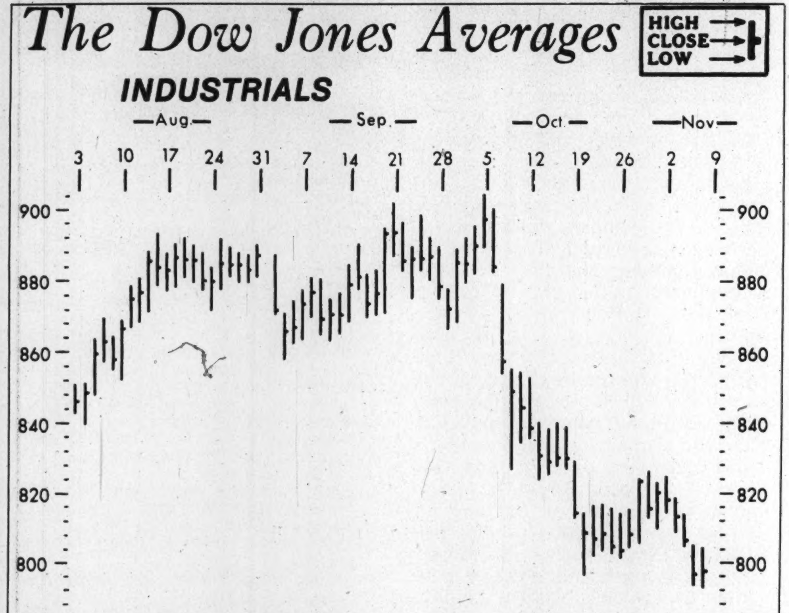
In five minutes the answer came on the screen. It said, "IN NINE MONTHS THE DOW JONES STOCK AVERAGES WILL BE AT 850."

In the beginning there was multiple regression. Multiple regression is a mathematical technique. Your goal is to find an equation relating variables you know (e.g., the consumer price index and the gross national product at the end of 1978) to the variable you want to know, such as the price of IBM at the end of 1979. Multiple regression gives you the equation that would have worked best in the past.

You can buy software to do multiple regression, but I decided to write my own. After a month I had a program that would fit into the 4K memory of the TRS-80 with enough room left over for 19 years of annual data concerning 12 variables. I picked 12 variables from "Annual U.S. Economic Data" put out by the St. Louis Federal Reserve Bank. I typed in RUN, entered the data and the TRS-80 went to work. In five minutes the answer came on the screen. It said, "IN NINE MONTHS THE DOW JONES STOCK AVERAGES WILL BE AT 850."

It's hard to describe the feeling of power you get when you know the future. For a month nothing disturbed me. But then one day when I was glancing through a back issue of **Value Line Investment Survey**, the roof fell in. The folks at Value Line know about multiple regression too! Even worse, their equation fit the data better than mine! I found that **Value Line** has been using multiple regression and computers since the fifties, and that all sorts of firms have sprung up with words like "econometrics" in their titles. These outfits use computers a lot bigger than my 4K TRS-80. How could I compete with them?

At first, frustration led to cynicism. As a nasty test I loaded all the information I could about the thirty-one stocks in my portfolio into the computer's 4K memory. Then I wrote the same type of information onto a small index card file, one card for each stock. I compared the two



William Mason, Box 316, Hornitos, CA 95325.

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CIRCLE 132 ON READER SERVICE CARD

Stock Tracking, cont'd...

systems in three categories: access time (including loading tape into memory), amount of information stored and cost. The card file won in each category. I tried to give the computer to my wife, suggesting she could store her recipes in it. She preferred index cards, pointing out a category I hadn't thought of: portability around the kitchen. I went to bed that night resolved to phone my brother-in-law in the morning and get him to take the silly thing off my hands.

During the night, however, I remembered a question my wife had asked. Did the profits we made on the Del Monte tender offer make up for the wad we had dropped in the Marine Midland debacle? She knew the answer, of course. The question was her way of taking a jab at Uncle Herbie. Uncle Herbie had recommended Marine Midland. We argued a lot about Uncle Herbie's stock recommendations.

The TRS-80 could compute the value of each of these accounts once a month and after a while I would know who was outperforming whom.

Then I saw the light. I could divide my thirty-one stock portfolio into groups, or "Accounts," as I decided to call them. Account number 1 would be stocks recommended by Uncle Herbie, account number 2 would be stocks selected by my wife, and so on. The TRS-80 could compute the value of each of these accounts once a month and after a while I would know who was outperforming whom.

But there was a catch. Suppose we had $10,000 invested in stocks recommended by Uncle Herbie, then we sold $2000 of his stocks to pay taxes. Uncle Herbie's account would have dropped by $2000 but that wouldn't be his fault. To fix this I pretended each account was a tiny mutual fund with an arbitrary initial number of shares, for example, 1000 each. Then each share in Herbie's "fund" was worth $10,000 divided by 1000 or $10. I call this the "account value per share." Every time I put money in or took money out of the account I changed the number of shares or "account divisor" so the account value per share remained the same. If I took $2000 out of Uncle Herbie's account I would change the account divisor to 800 so that the account

```
10 REM: STOCK MONITOR BY W.K.  MASON
12 REM: N=NUMBER OF STOCKS, M= NUMBER OF BONDS
14 REM: A(N+1) THROUGH A (N+4) = ACCOUNT DIVISORS
20 N=15: M=3
25 A(N+1)=1000: A(N+2)=1000: A(N+3)=1000: A(N+4)=1000
30 FOR L=1 TO N: A(L) =0: NEXT L
40 CLS: PRINT: PRINT: PRINT "CHOICES": PRINT
50 PRINT "1= LIST ACCOUNT NUMBERS"
52 PRINT "2= INPUT CURRENT PRICES"
54 PRINT "3= LIST STOCKS WITH CURRENT PRICES AND PROFITS"
56 PRINT "4= FIND CURRENT VALUE AND VALUE PER SHARE OF AN
ACCOUNT"
58 PRINT "5= LIST STOCKS WITH ORIGINAL PRUCHASE DATA"
60 PRINT "6= LIST ACCOUNT DIVISORS/FIND NEW ONES"
62 PRINT "7= LIST BOND AND CASH DATA"
70 PRINT: INPUT "WHAT IS YOUR CHOICE";J:CLS
80 ON J GOTO 90,120,160,,180,210,230,250
90 PRINT:PRINT:PRINT:PRINT "ACCOUNT NUMBERS":PRINT
100 PRINT "1=STOCKS RECOMMENDED BY MR.  X"
102 PRINT "2=STOCKS CHOSEN BY METHOD Y"
104 PRNT "3=STOCKS I SHOULD HAVE SOLD"
106 PRINT "4=ALL STOCKS ON MY LIST"
110 GOSUB 260:GOTO 40
120 FOR L=1 TO N
130 READ A$,B$,S,P,A
135 PRINT "ENTER PRICE OF ";A$
140 INPUT A(L):NEXT L
150 RESTORE:GOTO 40
160 B=1:C=1:GOSUB 170:GOSUB 260:CLS
162 B=12:C=N:GOSUB 170:GOSUB 260
164 RESTORE:GOTO 40
170 PRINT"STOCK","DATE BOT",""CURRENT PRICE","% PROFIT"
172 FOR L=B TO C
174 READ A$,B$,S,P,A
176 PRINT A$,B$,A(L) INT(100*(A(L)/P-1))
178 NEXT L:RETURN
180 GOSUB 190
182 PRINT:PRINT"ACCOUNT ";X;" CURRENT VALUE=";V:PRINT
184 PRINT"ACCOUNT ";X;" VALUE PER SHARE=";V/A(N+X)
186 GOSUB 260:GOTO 40
190 INPUT"ENTER ACCOUNT NUMBER ";X
192 V=0:FOR L=1 TO N
194 READ A$,B$,,S,P,A
196 IF(X=A)+(X=4) THEN V=V+S*A(L)
198 NEXT L
200 RESTORE:RETURN
210 B=1:C=11:GOSUB 220:GOSUB 260:CLS
212 B=12:C=N:GOSUB 220:GOSUB 260
214 RESTORE:GOTO 40
220 PRINT "SHARES", "STOCK", "PRICE BOT", "DATE BOT"
222 FOR L=B TO C
224 READ A$,B$,S,P,A
226 PRINT S,A$,P,B$
228 NEXT L:RETURN
230 PRINT"ACCOUNT NUMBER","DIVISOR"
232 FOR L=1 TO 4:PRINT L,A(N+L):NEXT L:PRINT
234 INPUT"DO YOU WISH TO FIND NEW DIVISOR? 0=NO,1=YES";Y
236 IF Y=0 THEN 40
238 PRINT:GOSUB 190
240 INPUT"ENTER DOLLAR AMOUNT IN (+) OR OUT(-) OF ACCOUNT";Y
242 PRINT
246 PRINT"NEW DIVISOR FOR ACCOUNT ";X;"=";Y*A(N+X)/V+A(N+X)
248 GOSUB 260:GOTO 40
250 FOR L=1 TO N:READ A$,B$,S,P,A:NEXT L
252 PRINT"AMOUNT","NAME","DATE DUE"
254 FOR L=1 TO M:READ A$,B$,S
256 PRINT S,A$,B$:NEXT L
258 GOSUB 260:RESTORE:GOTO 40
260 PRINT:INPUT"PRESS ENTER TO CONTINUE";A$:RETURN
480 REM: FORMAT FOR STOCK DATA IS
490 REM: STOCK NAME, DATE BOT, SHARES, PRICE PER SHARE,ACCOUNT #
500 DATA ATT,3-4-76,200,52,2
510 D.  ABC,1-2-30,100,10,1
512 D.  DEF,1-2-70,100,10,2
514 D.  GHI,1-2-70,100,10,3
516 D.  JKL,1-2-70,100,10,2
518 D.  MN,1-2-70,100,10,2
520 D.  OP,1-2-70,100,10,1
522 D.  QR,1-2-70,100,10,1
524 D.  ST,1-2-70,100,10,3
526 D.  UV,1-2-70,100,10,3
528 D.  WX,1-2-70,100,10,1
530 D.  YZ,1-2-70,100,10,1
532 D.  AB,1-2-70,100,10,2
534 D.  CD,1-2-70,100,10,3
538 D.  IBM, 2-3-70,50,150,2
540 REM:FORMAT FOR BOND DATA IS
550 REM:NAME,DATE DUE, AMOUNT
560 DATA WAR LAM, 4-1-85,10000
562 D.  XYZ SAVINGS,NONE,5000
564 D.  ABC,1-2-80,10000
```

Stock Tracking, cont'd...

value per share would still be $10 = $8000/800. The account value per share varied only if the stocks in the account went up or down (mostly down in Herbie's case - why is my wife always right?).

Quickly I whipped up my Level I stock tracking program which is included in this article. Although the stocks listed in the data statements are mostly fictitious they provide good examples. If you look at instructions 50 through 70 you can see the choices offered by the program.

Four sample accounts are listed in instructions 100 through 106. Taking them in reverse order (starting with account number 4 which is all stocks on my list) is the most important, of course. Since I'm the nervous type I find its current value once a week.

Account number 3 (stocks I should have sold, but didn't), palliates a standard investor problem. You have a big loss on a stock and you know you should dump it, but you can't bring yourself to do so. Sell it to your computer by putting it in account number 3. If your judgement is good the value per share of this account will decline while the value per share of your other accounts advances. If your judgement isn't good the record will speak for itself.

Account number 2 is stocks chosen by Method Y. Method Y can be low price-earnings ratios, high past earnings growth, companies incorporated before the Age of Aquarius, coin flipping, or anything.

> **We switched to a firm using big computers with a vast data base. They do the multiple regression for us. So far their picks are running neck and neck with coin flipping.**

Account number 1 is stocks recommended by Mr. X. Our Mr. X is no longer Uncle Herbie. We switched to a firm using big computers with a vast data base. They do the multiple regression for us. So far their picks are running neck and neck with coin flipping.

Finally, a couple of technical remarks. The stock list is on Data statements as part of the program. The format is: DATA stock name, date bought, number of shares, purchase price per share, number of account it belongs in. When you add stocks or take stocks out of an account you must change the account divisor and put in new data statements. The steps are:

1. Input the prices of the stocks in account just before the change (use choice 2).
2. Select Item 6. The computer asks you for the account number and dollar amount in or out of the account. Then it gives you the new account divisor.
3. Put the new account divisor into instruction 25 in place of the old one. Also, if you change the number of stocks in the list you must change instruction 20.
4. Put in the new data statements.

Well, there it is. This program provides a realistic use for the 4K computer in investing. For me it justifies the purchase of a TRS-80. In fact, after recording the value per share of each account for many months I think I have found a stock picking method better than coin flipping. But that's another story. ☐

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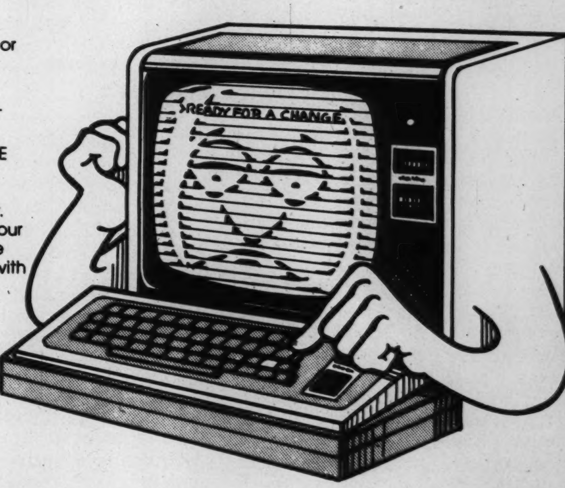

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CIRCLE 119 ON READER SERVICE CARD

For buying, selling and renting property

Real Estate Analysis

Mayer D. Liebman

A comprehensive look at real estate investment techniques. The program was written for a TRS-80 but does not use any special graphics.

The ideal investment is where you commit funds (preferably other people's funds) with the intention of minimizing risk, and safeguarding your capital while earning a generous return, (preferably a tax-free return), and at the same time being able to control, to the best of your ability, the outcome of your investment.

In our opinion, real estate is the only investment which, when bought properly, sold properly and managed correctly, can fit that description. When you consider the many factors working in real estate's favor, you will come to realize, as we did, that real estate is as close to a guaranteed investment as you can get.

To fully understand how real estate can serve as the perfect investment vehicle, take each advantage and consider it:

Safety

When was the last time you heard that someone had sold his home for less than he paid for it? Properly selected real estate is one of the safest investments you can make. Most real estate owners realize that their property values are continuing to increase every year. Real estate will hold or increase its value, and avoid a downslide loss better than almost any other form of investment. The demand for land will always continue to grow.

Also, you will never awaken one morning and find your investment stolen, lost, missing, or the "company has gone bankrupt." You can always see the property and no one can move it away.

Appreciation

Real estate, and most notably the single family house, has been appreciating at an average rate of 10 per cent for the last few years. Improved real estate continues to increase in value because of the demand for housing, increases in construction labor costs and increases in the cost of raw materials.

Real estate is as close to a guaranteed investment as you can get.

Yield

Sound real estate investments have always provided a larger overall yield than almost all other investments. First, we have the consistent real estate appreciation. Second are the tax advantages such as depreciation and capital gains treatment.

Many experienced real estate investors like to see at least a 20 per cent return on their investment (including cash flow, market value appreciation and tax savings). And it is obtainable.

Liquidity

It has been written many times that real estate is not liquid. This is true to a certain extent. Of course, real estate is not as liquid as a savings account, but properly priced single family homes can be sold in from 30 to 90 days. Much delay in the selling of a piece of real estate could be avoided if the asking prices were set realistically.

Leverage

Leverage means investing the least amount of capital possible when acquiring a property to earn the maximum percentage return on that investment by obtaining a mortgage (financing) for the highest practical amount.

As has always been characteristic in real estate investment, you can obtain financing for a part of the purchase price. The owner of a piece of real estate can control his investment with as little as 10 to 20 per cent of the purchase price being invested.

No alternate investment allows such a low down payment without the corresponding disadvantages. Real estate leverage allows the investor to receive the entire benefit of the property's appreciation in the market and depreciation of the entire value of the property for tax purposes. Under the new tax law, it is the only investment with those advantages.

Depreciation

Depreciation of real estate is the one factor that produces the high yields which are not found in other investments such as stocks and bonds. It is a tax break which gives you the right to deduct a certain percentage of the building's value each year (but not the land, since in theory land does not depreciate).

This is a non-cash expense. Actually, as the property is increasing in value, you are deducting a portion of its value on your tax form. If you buy the property from someone who has already depreciated it, you can start the depreciation cycle over again, as can the person who buys the property from you.

Depreciation, because it is an expense which costs you no money, is what real estate investors look for as a tax shelter. The effect of depreciation is to shield a part of your ordinary income from taxes.

Why single family houses, instead of raw land, shopping centers, or multi-unit dwellings? Because you may already be a homeowner yourself. You have an idea of what to look for in a house. You can easily understand the finances involved as they are quite similar to the financing you did on your own home. They are easily rented, easily maintained and can be managed by yourself. Dollar for dollar they usually out-perform all other modes of real estate for appreciation.

Mayer D. Liebman, 8105 Buckspark Lane East, Potomac, MD 20854.

Real Estate, cont'd...

Just think of how much you paid for your home and compare it to the price your neighbor just got for the home he recently sold. The single family home is affordable, depreciable, rentable, easily maintained and managed and, most important of all, appreciates over and above recent inflation.

In buying a single-family house as an investment, you'll have to consider many things, among them:

- Location
- Condition of the house and utilities
- Price
- Financing
- Projected return on investment

In this short article, we have time to consider only what is the most difficult to analyze and yet the most important in weighing the investment — that is, your projected return. This is what is known as "Property Analysis." This is where you record all the pertinent facts about your new found property down on paper so that you can see in black and white what this investment is going to produce. And you can use these same figures to compare it with other potential purchases. This is the "bottom line" in any real estate investment.

The single family house, has been appreciating at an average rate of 10 per cent for the last few years.

Suppose you spot a single-family attached house (known commonly as a "townhouse") with an asking price of $40,000. The down payment is 10 per cent, or $4,000, and you expect you could rent it for $350 per month, plus utilities. You can assume the existing mortgage on the house for $32,000 @ 8% for 30 years (Note: The lower rates on existing mortgages are one of the advantages of buying an older house. New mortgages on recently constructed houses now range over 10%), and the seller will take back a 2nd mortgage of $4,000 at 11% for 8 years. Analyze it as follows while referring to Table 1:

Line 1 — Gross Income: This is the monthly rental that you expect to get for the property multiplied by 12 to arrive at the annual amount of rent that you plan to receive.

Enter: $350 x 12 = $4,200

Line 2 — Vacancy: This is the percentage that will have to be subtracted from the gross income figure to arrive at the more realistic income figure. The best average is about a 5% vacancy factor. That is, one month out of 20 you will fail to rent the property.

Enter: 5% of $4,200 = $210

Line 3 — Gross Operating Income: This is the amount obtained by subtracting the vacancy factor from the gross income amount: This figure represents the actual amount of money you have to work with.

Enter: $4,200 - $210 = $3,990

Line 4 — Expenses: You will now have to list the expenses that will be incurred in renting and maintaining the property.

Line 5 — Taxes: On this line you should enter the real estate taxes that are levied on the property. In our area, this property would carry about $700 in taxes.

Line 6 — Insurance: The insurance that you normally will need on a rental property are fire, vandalism and malicious mischief. You need these to protect the actual improvements on the property. You will also need personal liability insurance to protect yourself against a negligence claim. The cost for the year will be about $100.

Line 7 — Utilities: Normally there will be no entry on this line since the tenant will be paying the costs of utilities. However, you may have to pay a minimal amount during the period of time the property is vacant and waiting for a tenant. Depending on the time of year when the property is vacant will determine the costs. During the summer we can estimate about $20 for

```
                    PROPERTY ANALYSIS

Address of property...........34 Park Street
Purchase price................$40000
First mortgage................$32000 @ 8% for 30 years
Second mortgage...............$4000 @ 11% for 8 years

1.   Gross Income.........................$4200
2.   Less: Vacancy........................$210
3.   Gross Operating Income...............$3990
4.   Less expenses:
5.   Taxes................................$700
6.   Insurance............................$100
7.   Utilities............................$20
8.   Advertising..........................$60
9.   Management...........................$0
10.  Civic Association....................$100
11.  Maintenance..........................$300
12.  Cleaning Services....................$100
13.  Legal & Accounting...................$150
14.  Total Expenses.......................$1530
15.  Net Operating Income.................$2460
16.  Less Loan Payments:
17.  1st Mortgage.........................$32000
     2nd Mortgage.........................$4000
18.  Interest.............................$3000
19.  Principal............................$571.66
20.  Total loan payment...................$3571.66
21.  Gross Spendable Income...............-$1111
22.  Plus: Principal Payment(s)...........$571.66
23.  Gross Equity Income..................-$540
24.  Less Depreciation....................$1333.33
25.  Taxable Income.......................$-1873.33

                  Tax Analysis

1.   Gross Equity Income(line 23)..........-$540
2.   + Tax consequences....................$749.33
3.   After Tax Income......................$209.33
4.   +Growth...............................$3200
5.   Net Equity Income.....................$3409
6.   Rate of return........................$56.82% per year

Formula:


         Net Equity Income        X 100  =
     -----------------------
Down Payment + Closing Costs
```

Table 1

Real Estate, cont'd...

utilities when the air conditioning will not have to be used.

Line 8 — Advertising: This would be the costs of placing ads in newspapers to try and secure a tenant. We would estimate a cost of about $60 for advertising in the example.

Line 9 — Management: Since we recommend that for maximum profit that you manage your own property, there normally will be no entry on this line. If you plan on using a management concern, then you can plan on paying a management fee of about 7% per year on the gross rental receipts.

Line 10 — Civic Association: Many developments have a civic association fee. This may cover maintenance of common areas, snow removal, etc. The costs on this house will be about $100 per year.

Line 12 — Cleaning Services: Normally when you are starting out with your first properties you will be doing your own cleaning of the house and your own painting, at least of the interior. We would estimate the initial cleaning of the house to be about $100.

Line 13 — Legal and Accounting: The accounting fees should be about $150 per year. This is providing nothing serious occurs and you don't have any legal problems.

Properly priced single family homes can be sold in from 30 to 90 days.

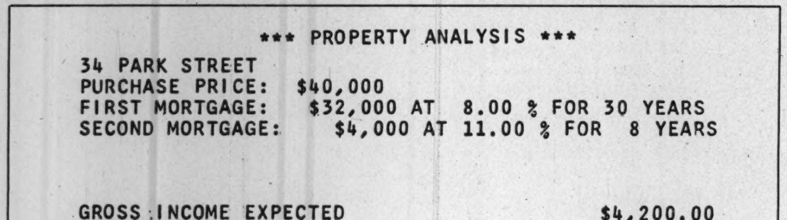
Line 14 — Total Expenses: =$1,530

Line 15 — Net Operating Income: This is the figure that is obtained by subtracting the figure for the total expenses from the figure that you obtained from the gross operating income. This figure is $2,460.

Line 16 — Less Loan Payments: Now you will have to subtract the loan or mortgage payments from the net operating income.

Line 17 — On this line is indicated the amounts for the different mortgages that may be placed on the property.

Line 18 — On this line will go the yearly interest that you are paying on the property. The interest on the second mortgage for the first year is $440. The interest on the first mortgage for the first year is $2,560.



```
                  *** PROPERTY ANALYSIS ***
  34 PARK STREET
  PURCHASE PRICE:   $40,000
  FIRST MORTGAGE:    $32,000 AT   8.00 % FOR 30 YEARS
  SECOND MORTGAGE:     $4,000 AT 11.00 % FOR  8 YEARS


  GROSS INCOME EXPECTED                          $4,200.00
  VACANCY LOSS                                     $210.00
  GROSS OPERATING INCOME                         $3,990.00
  TAXES                                            $700.00
  INSURANCE                                        $100.00
  UTILITIES                                         $20.00
  ADVERTISING                                       $60.00
  MANAGEMENT                                         $0.00
  CIVIC ASSOCIATION                                $100.00
  MAINTENANCE                                      $300.00
  CLEANING SERVICE                                 $100.00
  LEGAL AND ACCOUNTING                             $150.00
  TOTAL EXPENSES                                 $1,530.00
  NET OPERATING INCOME                           $2,460.00
  INTEREST AFTER ONE YEAR                        $3,000.00
  PRINCIPAL AFTER 1ST YR.                          $571.66
  TOTAL LOAN PAYMENT                             $3,571.66
  GROSS SPENDABLE INCOME                        -$1,111.66
  GROSS EQUITY INCOME                             -$540.00
  DEPRECIATION                                   $1,333.33
  TAXABLE INCOME                                -$1,873.33

                        *** TAX ANALYSIS ***
  TAX CONSEQUENSES                                 $749.33
  AFTER TAX INCOME                                 $209.33
  APPRECIATION                                   $3,200.00
  NET EQUITY INCOME                              $3,409.33
              RATE OF RETURN 56.82 % PER YEAR
```

This is an actual printout of the Property Analysis as produced by the enclosed program.

Line 19 — On this line will go the yearly principal payments. To determine the amount of the yearly mortgage payment that goes towards the principal is to subtract the interest from the total mortgage payment. On our property, the total yearly payment for the second mortgage is $745.01. For the first year the principal will be $745.01 - $440 = $341.01. The total yearly payment can be obtained from a table of loan amortization or from a computer program. The amount of principal reduction for the first mortgage will be the total yearly mortgage payment of $2817.67 - $2560 = $257.67.

Line 20 — Total Loan Payment: This line is the summation of the interest and principal payment or the total mortgage payments for the year for both the first and second mortgages.

Line 21 — Gross Spendable Income: By subtracting the mortgage payments from the net operating income will give us the gross spendable income or "cash flow."

In our situation the total loan payments as noted above are $3571.66. Also, as noted on Line 15, the net operating income is $2460. If we subtract our loan payments of $3571.66 from the net operating income of $2460 leaves a negative <$1111>, or you will have to come up with $92 per month to carry your investment. How can you be on your way to financial security if you have to come up with almost $100 per month to let someone else live in your house? Since we are planning for the appreciation of the property and the retirement of the principal of the loan, this monthly payment can be looked at as a forced saving. The only thing you have to remember is that you will be making this extra payment per month in the early years of the investment. As inflation drives prices up a smaller portion of your rent will go to the mortgage payment.

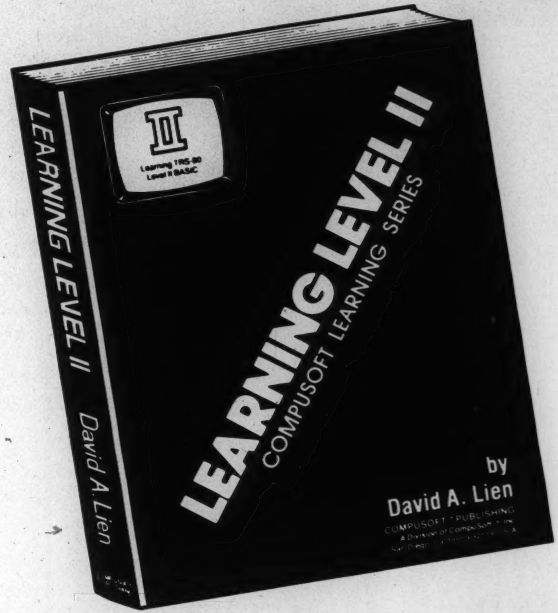
Depreciation is what real estate investors look for as a tax shelter.

Line 22 — Plus Principal Payment: At this point you will add back the principal payments. Since this money is going to retire the loans you are really not spending the money but are saving it. Thus, go to line 23 to actually find out what the property is costing.

Line 23 — Gross Equity Income: By adding the gross spendable income which is a negative <$1111> plus the principal payments which are $571.68 will give us a negative <$540>. Thus, the actual cost to carrying the property is $540 divided by 12 or $45 per month.

Line 24 — Less Depreciation: As noted elsewhere, depreciation is a

Here's Your 2nd Half . . .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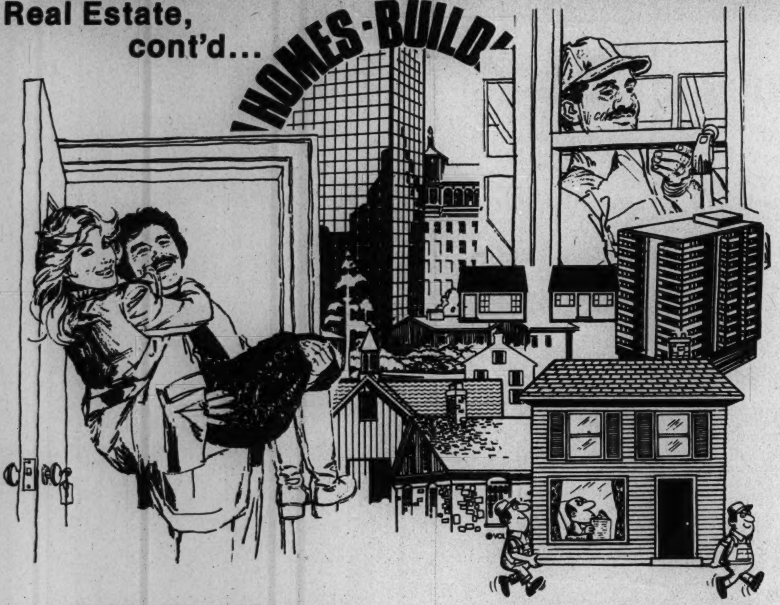
CIRCLE 122 ON READER SERVICE CARD

Real Estate, cont'd...



means that the government gives you to recover your original investment. In theory, the government allows you to set aside some money each year so that when the house wears out you will hve enough money to purchase a new house. In reality, however, the house will appreciate in value and so this merely becomes an accounting procedure. For used residential property we have chosen the 125 per cent declining balance method of depreciation and the useful life of the house to be 30 years. Since only the house can be depreciated, you will have to look at the most recent tax assessment notice to find out how much value has been attached to the land and how much for the house and improvements.

In the situation of our example, the house represents 80 per cent of the value and the land 20 per cent. Thus, since the house costs us $40,000, the amount that can be depreciated is $40,000 × 80 per cent = $32,000. Since we gave the house a life of 30 years, this means that the house will lose $\frac{1}{30}$ per year of its value. (Example: $32,000 divided by 30 = $1066.67). But since the government allows you to take 125 per cent of the depreciation amount for used homes, the actual amount that you can take off on your taxes is 125 per cent times $1066.67 or $1333.33. Thus, you will subtract this depreciation from the gross equity income to have the figure for either the total profit or the total loss on the property.

In our situation, since we have a gross equity income of a negative $541 (line 23) and since depreciation is a loss (or a negative number), the total loss (both real line 23 and imaginary line 24) is <$1873.33>.

At this point we know that we will be able to write $1873.33 off the income tax. If you are in the 40 per cent bracket, then you save $749 on taxes. If you go back to line 21, you see that you have to pay $92 per month out of pocket of $1111 per year to carry the house. But you save $749.33 in taxes, so in reality you only had to come up with $363 or $30.25 per month.

Tax Analysis

In order to project how much profit you can expect in the future, we now do what is called a tax analysis. This will give us the approximate rate of return on our investment.

In theory, the government allows you to set aside some money each year so that when the house wears out you will have enough money to purchase a new house.

Line 1 — Gross Equity Income: This figure is taken from line 23 of the Property Analysis. This line gives us a negative <$540>.

Line 2 — Tax Consequences: As we noted, if you are in the 40 per cent bracket, you will save $749.33 on the taxes.

Line 3 — After Tax Income: By adding Line 1 and Line 2 you will get your after tax income which is $209.33. (Remember that this figure takes principal repayment into account.)

Line 4 — Growth: We will estimate at this point that our property will increase by 8 per cent (conservative) annually for the foreseeable future. $40,000 at 8 per cent increase annually is $43,200, or a growth of $3,200 for the first year.

Line 5 — Net Equity Income: By adding line 3 and line 4 you will now get the total buildup of equity of your property:

209.33 + $3,200 =
$3,409.33 increase annually.

Your real estate investments should outperform virtually any other vehicle.

Line 6 — Rate of Return: By following this formula you will be able to estimate the rate of return on your investment.

FORMULA:

$$\frac{\$3,409 \times 100}{\$4,000 + \$2,000} = 56.82 \text{ per cent}$$

It should be noted that there are large income tax deductions the first year because of the costs involved with settlement. Closing costs in our area average about 5 per cent of the purchase price.

To be sure, the rates of return of your real estate investment will vary over time. As years go by, the amount you can depreciate will drop and so will the interest deduction on your mortgage loan. Most importantly, you'll face a capital gains on your profits when you choose to sell. Still, your real estate investments should outperform virtually any other vehicle. And it depends on only a few conditions:

- That you buy a home in good condition at fair market value in a good location.
- That you leverage the house, borrowing at least 80 per cent of the purchase price.
- That Congress continues to grant depreciation deductions for the full amount of the purchase price.
- That inflation continues at a rate of about 8 per cent per year.
- That the American Dream will never end, and that people will continue to want the joys of living in a private home. □

This article is based on the book, "How To Invest In The American Dream For Financial Security," by Mayer Liebman, D.D.S., and Barry Feldman. Available from Ridgeleigh Press, PO Box 34287, Washington, DC 20034. $12.95. The program was co-authored by Kenneth Kaplan.

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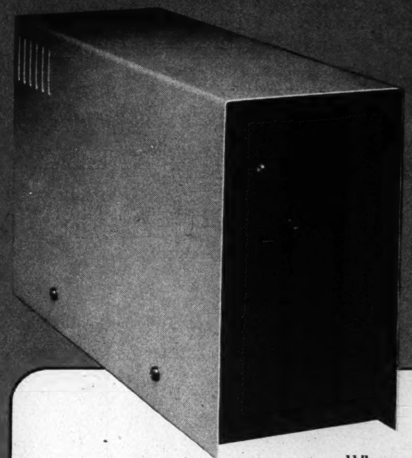

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```
5 '*********   PROPERTY ANALYSIS   **********
6 'WRITTEN BY KENNETH KAPLAN AND MAYER LIEBMAN
7 'JULY 1979
10 CLEAR 500
20 DEFINT J
30 DEFDBL L
40 DIM M(2),R(2),R1(2),R2(2),MO(2),PPMT(2),AMT(31,2),
50 DIM IN(30,2),B(14),A$(14),Y(2)              NET(30,2)
60 JFLAG=1
65 CLS
66 PRINT" INVESTMENT PROPERTY ANALYSIS"
67 PRINT" BY KENNETH KAPLAN & MAYER LIEBMAN
68 FOR N=1 TO 500: NEXT N
69 CLS
70 INPUT "ADDRESS OF PROPERTY";P$
80 INPUT "PURCHASE PRICE $ ";PUR
90 INPUT "FIRST MORTGAGE $ ";M(1)
100 INPUT "INTEREST RATE % ";R1(1)
105 INPUT "YEARS";Y(1)
110 R(1)=R1(1)/100
130 MO(1)=Y(1)*12
140 INPUT "IS THERE A SECOND MORTGAGE ";C$
150 IF LEFT$(C$,1)="N" THEN GOTO 230
155 CLS
160 INPUT "SECOND MORTGAGE $ ";M(2)
170 INPUT "INTEREST RATE % ";R1(2)
180 R(2)=R1(2)/100
190 INPUT "YEARS";Y(2)
192 CLS
195 PRINT "COMPUTING MORTGAGE INFORMATION"
200 MO(2)=Y(2)*12
210 JFLAG=2
220 REM COMPUTE YEARLY PAYMENTS
230 FOR J=1 TO JFLAG
240 R2(J)=R(J)/12
250 K=1. + R2(J):L=K(MO(J):N=M(J)*R2(J)*L
255 PPMT(J)=N/(L-1)
256 PPMT(J)=PPMT(J)*12
260 NEXT J
270 REM COMPUTE ANNUAL INTEREST AND PRINCIPAL
280 REM FOR 30 YEARS
290 FOR JK=1 TO JFLAG
300 JL=Y(JK)
310 AMT(1,JK)=M(JK)
320 FOR J=1 TO JL
330 IN(J,JK)=AMT(J,JK)*R(JK)
340 NET(J,JK)=PPMT(JK)-IN(J,JK)
350 AMT(J+1,JK)=AMT(J,JK)-NET(J,JK)
360 NEXT J
370 NEXT JK
375 CLS
380 DATA "GROSS INCOME EXPECTED ","VACANCY LOSS              "
381 DATA "GROSS OPERATING INCOME","TAXES                     "
382 DATA "INSURANCE             ","UTILITIES                 "
383 DATA "ADVERTISING           ","MANAGEMENT                "
384 DATA "CIVIC ASSOCIATION     ","MAINTENANCE               "
385 DATA "CLEANING SERVICE      ","LEGAL AND ACCOUNTING      "
386 DATA "TOTAL EXPENSES        ","NET OPERATING INCOME      "
430 FOR J=1 TO 14
440 READ A$(J)
450 NEXT J
460 FOR J=1 TO 12
470 IF J=3 THEN GOTO 510
480 PRINT A$(J);
490 INPUT " $ ";B(J)
500 CLS
510 NEXT J
520 B(3)=B(1)-B(2)
530 FOR J=4 TO 12
540 B(13)=B(13)+B(J)
550 NEXT J
560 B(14)=B(3)-B(13)
570 REM INTEREST AFTER ONE YEAR
580 IT=IN(1,1) + IN(1,2)
590 REM PRINCIPAL AFTER ONE YEAR
600 PR=NET(1,1) + NET(1,2)
610 REM TOTAL LOAN PAYMENT
620 TLP=IT + PR
630 REM GROSS SPENDABLE INCOME
640 GSI=B(14)-TLP
650 REM GROSS EQUITY INCOME
660 GEI=GSI + PR
670 REM DEPRECIATION--WE ARE USING 80% IMPROVEMENT VALUE AND 30 YEAR LIFE
671 REM A 125% DECLINING BALANCE IS USED
672 INPUT "DO YOU WISH TO ENTER YOUR OWN FIGURES FOR DEPRECIATION"; H$
674 IF LEFT$(H$,1) = "N" THEN GOTO 680
675 INPUT "WHAT IS THE VALUE TO THE LAND";D3
676 INPUT "WHAT % RATE WILL YOU BE USING (100,125,200) %";D4:D5=D4/100
677 INPUT "HOW MANY YEARS WILL YOU DEPRECIATE THE PROPERTY"; D6
678 DE=(D3/D6)*D5
679 GOTO 690
680 DE=((PUR*.80)/30)*1.25
690 REM TAXABLE INCOME
700 TI=GEI - DE
710 REM TAX ANALYSIS
715 CLS
720 INPUT "WHAT IS YOUR TAX BRACKET % ";TX
730 REM TAX CONSEQUENSES
740 TC=TI * (TX/100) * -1.
750 REM AFTER TAX INCOME
760 AT= GEI + TC
770 REM GROWTH
780 PRINT "WHAT IS THE PERCENT APPRECIATION FOR HOMES"
782 INPUT "IN YOUR AREA %";AP
790 GR=PUR * (AP/100)
800 REM NET EQUITY INCOME
810 NE= AT + GR
820 REM RATE OF RETURN
830 PRINT "WHAT ARE THE CLOSING COSTS ? "
835 PRINT "IF UNKNOWN KEY 2 "
837 INPUT CC
840 IF CC= 2 THEN CC = PUR * .05
850 R5=PUR-M(1)-M(2):R6=R5 + CC : R7 = NEI/R6
860 RR = R7 * 100
870 CLS
880 PRINT CHR$(23)
890 PRINT "THE RATE OF RETURN FOR THE"
900 PRINT "PROPERTY LOCATED AT" : PRINT : PRINT P$:PRINT
910 PRINT "WILL BE: ";
920 PRINT USING "##.## % PER YEAR";RR
930 INPUT "KEY ENTER";E$
935 CLS
940 PRINT "DO YOU WANT TO REVIEW THE"
950 PRINT "PROPERTY ANALYSIS ON THE CRT"
970 INPUT D$
980 IF LEFT$(D$,1)="Y" THEN GOSUB 1090
990 PRINT "WOULD YOU LIKE A PRINTOUT OF THE ANALYSIS ?"
1000 INPUT D$
1010 IF LEFT$(D$,1) = "N" THEN GOTO 1520
1015 CLS
1016 JP=1
1020 PRINT CHR$(23)
1030 PRINT "PLEASE MAKE SURE THAT THE"
1040 PRINT "***  PRINTER IS ON  ***"
1045 INPUT"KEY ENTER";E$
1050 P1=PEEK(16422):P2=PEEK(16423)
1060 POKE 16414,P1:POKE 16415,P2
1070 GOSUB 1090
1080 POKE 16414,88:POKE 16415,4
1085 GOTO 1520
1090 IF JP<>1 THEN INPUT "KEY ENTER";E$:CLS
1100 PRINT "*** PROPERTY ANALYSIS *** ":PRINT:PRINT P$
1110 PRINT "PURCHASE PRICE:";
1120 PRINT USING "$$###,###";PUR
1130 PRINT "FIRST MORTGAGE: ";
1140 PRINT USING "$$###,### AT ##.## % FOR ##
     YEARS";M(1),R1(1),Y(1)
1150 IF JFLAG <> 2 THEN GOTO 1190
1160 PRINT "SECOND MORTGAGE: ";
1170 PRINT USING "$$###,### AT ##.## % FOR ##
     YEARS";M(2),R1(2),Y(2)
1180 PRINT:F$="$$##,###.##":PRINT:PRINT:
1185 IF JP<>1THEN INPUT "KEY ENTER";E$
1186 CLS
1190 FOR J=1 TO 14
1200 PRINT A$(J);
1210 PRINT TAB(32);" ";
1220 PRINT USING F$;B(J)
1230 NEXT J
1235 IF JP<>1THEN INPUT "KEY ENTER";E$
1240 CLS
1250 PRINT "INTEREST AFTER ONE YEAR";,,
1260 PRINT USING F$;IT
1270 PRINT "PRINCIPAL AFTER 1ST YR.";,,
1280 PRINT USING F$;PR
1290 PRINT "TOTAL LOAN PAYMENT     ";,,
1300 PRINT USING F$;TLP
1310 PRINT "GROSS SPENDABLE INCOME ";,,
1320 PRINT USING F$;GSI
1330 PRINT "GROSS EQUITY INCOME    ";,,
1340 PRINT USING F$;GEI
1350 PRINT "DEPRECIATION           ";,,
1360 PRINT USING F$;DE
1370 PRINT "TAXABLE INCOME         ";,,
1380 PRINT USING F$;TI
1385 IF JP<>1THEN INPUT "KEY ENTER";E$
1390 CLS: IF JP=1 THEN PRINT:PRINT:PRINT
1400 PRINT TAB(10);" *** TAX ANALYSIS *** "
1410 PRINT "TAX CONSEQUENSES ";,
1420 PRINT USING F$;TC
1430 PRINT "AFTER TAX INCOME ";,
1440 PRINT USING F$;AT
1450 PRINT "APPRECIATION     ";,
1460 PRINT USING F$;GR
1470 PRINT "NET EQUITY INCOME";,
1480 PRINT USING F$;NE
1485 PRINT:PRINT
1490 PRINT:PRINT "RATE OF RETURN ";
1500 PRINT USING "##.## % PER YEAR ";RR
1505 IF JP<>1THEN INPUT "KEY ENTER";E$
1510 RETURN
1520 CLS
1530 PRINT CHR$(23):PRINT " *** GOOD LUCK ***"
1540 GOTO 1540
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Do you just hanker for that one little application that could make even the biggest skeptic go "Ohh!" and "Ahh!"?

You can run your computer in a large scale manner, convince the skeptics in your house and at the same time produce usable outputs for both amateurs and small businessmen alike. Can you give me: 1) the amounts in dollars and cents, 2) the mean, the standard deviation and future projections, and 3) either a video screen graph or a hard copy graph of your electric bill for the past two years? I can and, in addition, I can give it to you (or IRS) in many more areas than my electric bills — all in a matter of seconds.

This article will deal with 3 programs: EXPENSES, TRANSFER/EXP, and GRAPH/EXP. The programs have been written for the TRS-80 Level II, 32K (or 48K), with a disk and line printer. The line printer used is the IDS-225, but the programs will run with any 80 column printer after only slight modification (such as removal of expanded print commands).

First, some general remarks that apply to the package as a whole. You will note some program steps in the listings that appear to be needless and serve no purpose. I assure you they are there for a reason. In my attempts to go "Bigtime" I experienced many unexplainable errors — not explainable from the TRS-80 books, that is. Just as I learned from experimenting that the best cure for keybounce was to insert Tunerlube Jelly into the key after removing it, so I had to start experimenting to find out the causes of my erratic machine behavior. What was my trouble? You name it and I was having it! Incomplete reads/writes, all kinds of disk errors, along with much unexplained garbage. After much wailing and gnashing of teeth, I determined the following to be necessary for the operation of my system:

1. removal of the power packs from the expansion interface, placing them to the side;
2. aluminum foil between the expansion interface and the video screen;
3. a fan on the system when working;
4. false loops to slow down the disk during rapid read/writes, as reflected in the program listings;
5. loading of blanks to the disk buffer between read/writes.

Now, I'm pleased to report that my TRS-80 is operating right at 100%, 4 to 6 hours per day, all of the time.

The programs are long. For those of you who will take the time to contact me first, I'll try to arrange to make a disk/tape copy provided you will furnish the tape/disk and reimburse me for the postage and the gas to get to the post office. I will accept prepaid calls before 10 PM in the evening to answer any question that you may have. If you want a copy made, you'd best call first because I am not set up for any large scale reproduction. For those of you who live in a different time zone, I would appreciate your checking the time here in Florida before calling because I put my recorder on at 10 PM.

Expenses Program

EXPENSES is a general purpose TRS-80 program that stores date and amount information into 20 different accounts. The information is stored to the accounts using the random file technique. The information can be recalled for the purpose of 1) display of the entries in each account; 2) graphing of the entries in each account to the video screen and/or line printer; and 3) display of statistical data for each account to date.

I have named the accounts for my own use. However, the program keeps track of the accounts by using variables E1-E20, so you may change the name of the accounts to any name(s) you wish by merely changing the PRINT and the LPRINT statements starting at line number 2000. The number of accounts may also be altered to more or less than 20 by altering the value of "Z" where appropriate. Altering the number of the accounts would be difficult at best and I do not recommend trying this until you feel certain you understand the program thoroughly. Instead of altering the numbers of accounts, I suggest that you carry the 20 and use only the ones you need, keeping the unused ones as dummy accounts with a zero beginning entry and carrying them that way until you want to use them.

The printer I have is an IDS-225, and I rate it at A+. The LPRINT CHR$(n) statements in the program control the print size on my printer. You may delete them from your program and/or substitute the codes for your printer. All printing is upper case.

The program will accept and calculate zero amounts for the purpose of graphing and computing statistics.

Entries are made to each account in response to screen prompts. When entering information for the date, you may exercise some degree of individual preference. The only restriction is that the date entry cannot exceed 9 characters nor be shorter than 8 characters. I have elected to use a three letter month followed by a comma and then the year (e.g., JUN,1979 or SEP,1979). After you play with the program for awhile, you might prefer to use the actual day's date. Be sure to stick to one format, whatever you decide. Option #3, for example, searches the account for a match which is why consistency is important.

Bethany Prendergast, 10129 Leisure Lane North, Deerwood, Jacksonville, FL 32216.

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What versions are available?	TRS-80, APPLE II COMMODORE PET MICROSOFT, CBASIC2 CP/M MICROPOLIS: EXIDY SORCERER, VECTOR MZ, DYNABYTE CROMEMCO III	WANG CBASIC2 CP/M	MICROSOFT CP/M	CBASIC2 CP/M
What is the price?	MICROLEDGER, A/P, A/R, INV, PERS: $140.-each. MAXILEDGER, A/P, A/R: $350.-each.	GL, A/P, A/R, PAYROLL: $250.-each. Cost of configuring must be added!	GL, A/P, A/R, PAYROLL, INVENTORY $1000 each.	GL $995.- A/P $750.- A/R $750.- INV. $500.-
Hardware options	40 column CRT 64 column CRT 80 col. terminal 80 col. printer included	64 col. CRT only 132 column printer only	80 col. CRT only 132 column printer only	cursor addressable terminal only 132 column printer only.
Is source code included?	YES, INCLUDING PROGRAM FLOWCHARTS.	YES	YES	NO
What type of after-purchase support is offered?	1 YR WARRANTY & CORRECTION OF DEFECTS THROUGH DEALER. INDIVIDUAL PROGRAM AUTHORS AVAILABLE FOR QUESTIONS.	NONE	1 YR WARRANTY & CORRECTION OF DEFECTS THROUGH DEALER.	TECHNICIANS AVAILABLE FOR QUESTIONS. UPDATES MADE AVAILABLE FOR A FEE.

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Package, cont'd...

When the program is first run, it will display 5 options and ask you to select one. On your first run, select option #1 and make at least one date and amount entry for each of the 20 accounts. If you have no entry to an account or do not choose to use an account, enter the current month, year and zero for the amount. The program will accept and calculate zero amounts for the purposes of graphing and computing statistics. There is one exception to this. Because the TRANSFER/EXP program initializes the accounts to a zero as the first entry, the statistics routine checks first to see if the first entry is a zero. If it finds a zero as the first entry it passes it by and selects the second entry to start computation. After you have used option #1 to initialize everything you probably won't need to use it again. The rest of the options are self-explanatory. If you have any questions as to which one to use, fall back on option #2. It calls out the entire file and tells you what's on it. It also should be used to call an account for graphing or statistical purposes.

The EXPENSES program doesn't begin to pay off for you until you have accumulated some small amounts of data. Its value lies in two areas; to store and retrieve and to display trends. For example, I can tell (after accumulating 6 months data) just how much of a gasoline savings I realized when I switched over to a Diesel Olds.

In addition to being able to recall in seconds, individual expenditures (such as the last time I paid my dentist) I can give you a pictorial analysis, in the form of a graph, on my video screen in a flash. You will be surprised at just what this program will show up about things that you never had the means to examine before — especially if you are in business. Once again, it is necessary to enter a fair amount of history initially, or wait a few months for it to accumulate.

I generally batch enter my entries from a small book I carry around with me (and which serves as an audit trail if a disk were to 'bomb'). Every three or four days, I enter all my expenditures onto a disk labeled my "DAILY DISK." At the completion of each entry session, I get a printout of the account totals to date. Accordingly, if my system were to go down, I have both my original entry book and a copy of the totals from the last input session to permit me to recover. At the end of the month, I transfer my account totals (using the TRANSFER/EXP program) to a "MONTHLY DISK" and reinitialize the "DAILY DISK" for a new month. I keep a backup disk for the "MONTHLY DISK," incidentally, so I feel that I have a sufficient audit trail in the event of some calamity.

The EXPENSES program is composed of fairly complex routines. An in-depth understanding of the program would require a good foundation in Basic programming to include a thorough working knowledge in the areas of string manipulation and the use of random files to pack data. Unfortunately, it is hard to find a good elementary treatise on these subsections of Basic. It should be possible for you to study the program in conjunction with your TRS-80 book, however, and, taking a command at a time, slowly piece together just what is happening. To help you, the following is a line-by-line breakdown of the program:

I can give you a pictorial analysis, in the form of a graph, on my video screen in a flash.

LINES #90 - 590:

This portion of the program is the graph routine to the video screen. It graphs the data that has been stored under A(X) by the expense parts of the program.

The data is graphed on an X-Y axis basis and is scaled down (if necessary) to fit the screen. Some of the accuracy is lost by taking the integer function of the Y value in line 200, and by the scaling, but its purpose is to merely show a relationship of one entry to another and display trends.

LINES #600-950:

This portion of the program is the statistical routine. A prompt appears on the screen after the graphing routine or if the graph option was bypassed asking if you want statistical data. The routine gives the mean, the standard deviation and the coefficient of correlation for the account you are dealing with at the time. Future projections can be requested at this time.

LINES #960-1040:

This is the beginning of the program and gives a general explanation of what the program does along with the different options that are available for running. The month and year are carried under Y$(X) and the amounts are carried under A(X).

LINES #1100 - 1140:

This portion of the program gives the five options permitting the entry and/or retrieval of data. Option #1 is to be used for the initializing of accounts the first time through. Options #2, #3, #4 and #5 are self-explanatory. Option #5 permits the batching of your entries to all accounts and permits you to enter large amounts of data in a relatively short period of time. This option allows you the luxury of not having to post your entries everyday; instead, you may post to the accounts as seldom as once a week.

LINES #1170 - 1260:

Option #1 begins at #1170 and jumps to #2140 - 2260 to list the 20 different accounts by name and number (E1-E20). Variables E1-E20 identify each account and are then carried as F$ throughout the remainder of the program. The entry of data for option #1 takes place in #1200-1240, with a print of the data to the video in #1430. The saving of the data takes place at lines #1700 - 1740.

LINE #1280:

Start of option #2.

LINES #1310 - 1340:

Check to make sure that file exists on the disk.

LINES #1350 - 1520:

Opens file F$ and brings the file into RAM. File is then printed using 0$ format concluding with a total.

LINES #1530 - 1800:

Permit corrections or additions to files. Note that all files are stored using the random file designators and are packed 16 date and amount entries to a sector. Each file manipulation must unpack and/or pack before moving on to a save or other handling of the data. A loop is set up to load each date and its corresponding amount into the buffer up to 16 times, dependent on the number of entries. (See lines #1700).

The beginning of the program gives a general explanation of what the program does along with the different options that are available for running.

You are cautioned to remember as you step through this that if you have less than 16 entries you must stop at your last entry. Correspondingly, your loop must take into account that there may be more than 16 entries. An alteration would have to be made at this point if your memory did not permit all data for an account to be brought into RAM. I did not provide for this true 'random handling' because I cannot see any single account having that many entries before I retire that disk.

LINES #1810 - 1840:

This routine returns the dollar amount entry for the given date.

LINE #1850:

Goto the print subroutine.

LINES #1860 - 1870:

Enter account identifier (E1-E20) and the date.

LINE #1940:

Jump to error routine if you are

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Package, cont'd...

THE BATTERED BUCK
SAVINGS ACCOUNT
50

attempting a read from a file that has not been established yet.

LINES #1960 - 2060:

Returns file requested in line #1870 by T$.

LINES #2090 - 2120:

Prints file name, date and amount to line printer.

LINES #2130 - 2700:

Contain recurring subroutines to print out file names.

LINES #2710 - 2780:

Prints current date heading on line printer.

LINES #2800 - 3150:

Brings in all files one at a time printing file totals to video and/or line printer.

LINES #3160 - 3170:

Beginning of option #5 for batch entries to all accounts.

LINES #3190 - 3210:

Input of data.

LINE #3220:

Total your entries for display on video.

LINE #3280:

Permits positing to any one (or all) accounts.

LINES #3320 - 3340:

Zero out Y$(X) and A(X) because total to that account has been saved under CO for amount and Q$ for date.

TRANSFER/EXP is the easiest of the three programs to understand.

LINE 3440:

Prints the name of the account being handled.

LINES #3450 - 3480:

Checks to see if file is on disk.

LINES #3510 - 3720:

Bring in each file, add new information and write it back to the disk.

LINE #3730:

Check that all files have been counted.

LINES #3750 - 3800:

If last sector was full, write information to a new sector.

LINES #3820 - 3950:

Create a new file.

Transfer Expenses Program

TRANSFER/EXP is the second program of the EXPENSES PROGRAM PACKAGE. It presumes some knowledge of the EXPENSE program, at least to the extent of understanding what it does.

TRANSFER/EXP is the easiest of the three programs to understand in that it is, for the most part, operator independent. Once you start to run it, it sort of takes off by itself. Operator intervention is called for by video prompts, but is limited. You are given the option of specifying some hard copy printout only. The result of the operating time is devoted to changing disks when requested.

TRANSFER/EXP is a special purpose utility program. It is intended to deal only with those random files created by EXPENSES. The "DAILY DISK" is totaled by each individual account and the totals are retained in RAM. The "DAILY DISK" is then exchanged for the "MONTHLY DISK" and the totals are written to the monthly accumulation for each account. At the completion of the transfer of the totals, you are asked if you want to reinitialize the daily accounts. A "Yes" answer will cause the screen to prompt for the reinsertion of the "DAILY DISK" and the old account entries will be killed. The program goes on to make a new first entry for each of the 20 accounts of the month and the year with the insertion of a zero for the amount. Accordingly, each account now contains only one entry on the "DAILY DISK"; namely, month, year and $0.00.

As I stated previously, there is a backup in the event of a system failure with your daily accounts. Specifically, you have original documents and the hard copy printout after each entry session. Unfortunately, there is always the possibility that you could have a system catastrophy resulting in destruction of both the "DAILY DISK" and "MONTHLY DISK." I agree that such a thing is highly unlikely, but it is better to plan for the worst. This is why the first part of this program gives you a hard copy printout of each account on the daily disk. If you retain this printout and the original documents, you can reconstruct and/or build new disks with very little effort. I also go one step further and back up my monthly disk each month.

If you have studied the EXPENSES program in any detail, you will find that the same logic is carried forward into the routines for this program. The following is a summation of the program by line numbers:

Some of my students have called this program "tricky."

LINE #150 - 190:

A blinking prompt routine using the INKEY$ statement.

LINES #320 - 490:

The daily files are opened and the entries totaled for each account. The account totals are carried under T(Z). If you asked for hard copy in line #80 it is printed out in #490.

LINES #540 - 1040:

#550 jumps back to another blink routine starting at line #230 and, upon completion, the totals are transferred to the "MONTHLY DISK." The new date entry is carried as Q$. Each file is opened and read. The new date, Q$, and the appropriate total under T(Z) is added on to the Y$(X) and A(X) columns. The new information is written out to the disk starting at E1 to E20. If you attempt a write to an account that has not been opened on the monthly disk, use option #1 of EXPENSES to open it. The packing and the unpacking of the file buffer is the same as with EXPENSES.

LINES #1110 - 1250:

Each account is killed off the "DAILY DISK." Line #1260 requests the new month and year to serve as the new first entry to each account as it is reinitialized.

LINES #1370 - 1420:

New entry is made as each account is reinitialized.

LINES #1420 - :

Program concludes.

Graph of Expenses Program

GRAPH/EXP is the last program of the EXPENSES PROGRAM PACKAGE. The GRAPH/EXP program is a special purpose program that will take information from the files, established by EXPENSES and TRANSFER/EXP, and graph that information to your line printer. The information is graphed to the line printer on the X-Y axis with the entries represented on the Y axis and the sequence of the entry shown on the X axis. Accordingly, the first entry is graphed to the 1st line of X, and so on.

Package, cont'd...

Some accuracy is sacrificed by virtue of converting the entries to integers and by scaling the entries down to not exceed 90 (the number of print columns).

Some of my students have called this program "tricky." I'm not sure that is an appropriate way to refer to any program, but in any event, I truly did not intend it to be so. I wrote the program because I found the video screen graph to be difficult to study. Also, the video graph is, at best, temporary and I find that I often want to examine where my accounts are headed in the convenience of my armchair. All I am looking for is a hard copy printout that will allow me to carefully compare my entries. If I spot something that looks out of line, I'll go to the account itself for a more accurate examination.

The crux of the program is in understanding the way I convert the numeric entries to strings and how I then locate the print symbol on that string. The whole print line is assembled in memory before it is printed. The technique used to accomplish this is really quite simple. For example, let's examine how I convert $15.00 to a string: 1) enter the number you want to convert as the upper limit on a loop, FOR X = 1 TO 15 2) Select a string variable that has been set to zero and add any character to it as it goes through the loop, A$ = A$ + "." 3) Print the string variable at completion and it will contain the number of characters equal to the original number.

```
10  A$ = ""
20  FOR X = 1 TO 15
30  A$ = A$ + "."
40  NEXT X
50  PRINT A$
```

Your video will now display:

```
...............
```

That's all there is to it! I actually have the strings display periods while the program runs so you can see something happening instead of watching a blank screen.

I find that I often want to examine where my accounts are headed in the convenience of my armchair.

I have elected to use a 90 column print format. You may alter this program to run on any line printer by changing the loops to correspond to the number of print columns you want to use. The LPRINTCHR$(30) is peculiar to the IDS and may be deleted.

A breakdown of the program by line numbers is as follows:

LINE #80:
The number of lines in the X axis (the length).

LINES #90 - 100:
Enter the file to be read.

LINES #110 - 170:
Open the file and bring in the entries to RAM.

LINES #200 - 240:
Convert the entries to integers.

LINES #260 - 400:
If the entries are > 90 scale them down.

LINES #410 - 460:
Set up a loop that converts the numeric values into strings of periods stored under A$(I).

LINE #480:
Display the strings of periods on the video screen.

LINE #520:
Print the Y axis increments.

LINES #530 - 620:
Print the Y axis.

LINES #630 - 830:
Set up each line for a print and locate the print symbol on that line (#750). Repeat until all entries are finished.

LINES #880 - 970:
If X lines have been called for to extend the graph beyond the last entry graphed they are now printed. □

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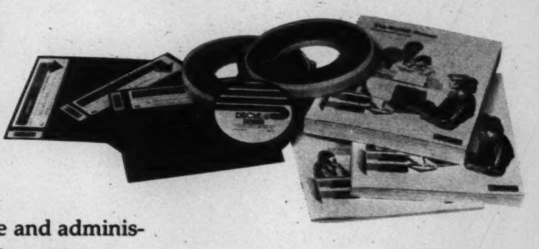

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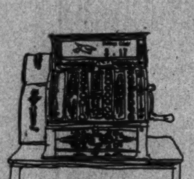
20 '-........................EXPENSES..............................
30 '-PROGRAM BY BETHANY PRENDERGAST 10129 LEISURE LANE N.
40 '-DEERWOOD- JACKSONVILLE, FLORIDA 32216 ( 904-642-1902 )
50 '-WRITTEN FOR TRS80, LEVEL II, 32 OR 48 K WITH (1) DISK
60 '-GOOD LUCK....AUTHOR WILL ACCEPT PREPAID CALLS BETWEEN
70 '-7-10 IN THE EVENING IF YOU HAVE PROBLEMS!!!
80 '-PROGRAM BEGINS AT 960
90 '-GRAPH ROUTINE
100 CLS: GOTO960
110 GOTO120
120 CLS:GOSUB 320
130 REM-THIS IS A GRAPHING PROGRAM , IT WILL GRAPH ITEMS
140 REM-TAKEN FROM DATA STORED UNDER A(X)...
150 CLS
160 PRINT@ 66,"Y";
170 PRINT@ 1023,"X";
180 IF A(1) =0 THEN FF7=2 ELSE FF7=1
190 FOR F=FF7 TO Z
200 Y=A(F): Y= INT ((47-(Y/G))+.5)
210 FOR SZ= 1 TO 47
220 SET(F,Y)
230 Y=Y+1: IF Y>47 THEN 250
240 NEXT SZ
250 NEXT F
260 Y= 47
270 FOR X = 0 TO 127 : SET (X,Y) : NEXTX : X=0
280 FOR Y = 0 TO 47  : SET(X,Y) : NEXT Y
290 FOR WW=1 TO 1000: NEXT WW
300 GOTO 1780
310 '-GRAPH BY B. PRENDERGAST 11/1/78
320 G=0:GG=0
330 FOR S= 1 TO Z
340 IF A(S)<47 THEN G=1:GOTO560
350 IF A(S)<94 THEN G=2:GOTO560
360 IF A(S)<141 THEN G=3:GOTO560
370 IF A(S)<188 THEN G=4:GOTO560
380 IF A(S)<235 THEN G=5:GOTO560
390 IF A(S)<282 THEN G=6:GOTO560
400 IF A(S)<329 THEN G=7:GOTO560
410 IF A(S)<376 THEN G=8:GOTO560
420 IF A(S)<423 THEN G=9:GOTO560
430 IF A(S)<470 THEN G=10:GOTO560
440 IF A(S)<517 THEN G=11:GOTO560
450 IF A(S)<564 THEN G=12:GOTO560
460 IF A(S)<614 THEN G=13:GOTO560
470 IF A(S)<658 THEN G=14:GOTO560
480 IF A(S)<705 THEN G=15:GOTO560
490 IF A(S)<752 THEN G=16:GOTO560
500 IF A(S)<799 THEN G=17:GOTO560
510 IF A(S)<846 THEN G=18:GOTO560
520 IF A(S)<893 THEN G=19:GOTO560
530 IF A(S)<940 THEN G=20:GOTO560
540 IF A(S)<987 THEN G=21:GOTO560
550 IF A(S)=>987 THEN PRINT"Y POINTS TOO LARGE TO BE GRAPHED"
                                                        :GOTO1780
560 IF G=>GG THEN GG=G
570 NEXT S
580 G=GG
590 RETURN
600 '-STATISTICS ROUTINE
610 R=0:M=0:P=0:O$="$$###,##.##"
620 IF A(1)=0 THEN II7=2 ELSE II7=1
630 FOR I= II7 TO N
640 D=A(I):P=P+D:M=M+D[2
650 NEXT I
660 IF II7=2 THEN N=N-1
670 R=P/N
680 V=(M-N*R[2)/N
690 SD=SQR(V)
700 CLS:PRINT"MEAN = ";R
710 PRINT"STANDARD DEVIATION = ";SD
720 J=0:K=0:L=0:M=0:R2=0
730 FOR I= 1 TO N
740 X=I:Y=A(I)
750 J=J+X:K=K+Y:L=L+X[2:M=M+Y[2
760 R2=R2+X*Y
770 NEXT I
780 B=(N*R2-K*J)/(N*L-J[2)
790 A=(K-B*J)/N
800 J=B*(R2-J*K/N)
810 M=M-K[2/N
820 K=M-J
830 R2=J/M
840 PRINT"COEFF.OF CORRELATION (1 IS PERFECT) = ";SQR(R2)
850 QQ$=""
860 PRINT:PRINT"DO YOU WISH TO PREDICT A FUTURE VALUE (YES/NO) ?"
870 INPUT QQ$
880 IF QQ$="" THEN 860
890 IF QQ$="NO" THEN 950
900 IF QQ$="YES" THEN CLS
910 INPUT"ENTER MONTH NO.(1,2,...X) YOU WANT ESTIMATE FOR";X
920 Y=A+B*X
930 PRINT"PROJECTION ESTIMATED AS";USING O$;Y
940 PRINT"ANOTHER ESTIMATE (YES/NO) ?": GOTO 870
```



```
950 CLS:PRINT"PROGRAM CONCLUDED":END
960 CLS:PRINT"THIS PROGRAM PERMITS THE MANIPULATION OF 120"
970 PRINT"MONTHS OF DATA TO/FROM RANDOM FILES. DATA MUST BE"
980 PRINT"ENTERED AS DATE ( SEE REMARKS LINES ) FOLLOWED BY"
990 PRINT"'AMOUNT'. THE AMOUNT IS MANIPULATED AS SINGLE PRECISION."
1000 PRINT"THIS PROGRAM WILL ALSO GIVE A VIDEO DISPLAY"
1010 PRINT"WITH A GRAPH AND WILL  PROVIDE STATISTICS ON DATA"
1020 PRINT"IF DESIRED. OPTION #2 FOR ADD/DELETE/CORRECT ITEMS."
1030 PRINT"OPTION #3 ALLOWS ENTRY OF MONTH,YEAR AND PROGRAM THEN"
1040 PRINT"RETRIEVES CORRESPONDING AMOUNT."
1050 PRINT
1060 '-PROGRAM BY BETH PRENDERGAST 11/20/78
1070 '- Y$(X) = MONTH,YEAR
1080 '- A(X) = AMOUNT
1090 CLEAR(3500): DIM Y$(150): DIM A(150):DIMB(150):DIM T(150)
1100 PRINT "ENTER: 1 - TO OPEN FILE FOR FIRST TIME"
1110 PRINT "       2 - BRING OUT WHOLE FILE FOR ADD/CORRECT/LOOKSEE
1120 PRINT "       3 - RETRIEVE A MONTH'S ENTRIES FROM A FILE
1130 PRINT "       4 - PRINT TOTAL OF EACH FILE TO DATE
1140 PRINT "       5 - BATCH ENTER TO 1 OR MORE ACCOUNTS
1150 INPUT Q
1160 ON Q GOTO 1170 ,1280 ,1810 ,2710 ,3150
1170 CLS:GOSUB 2130
1180 INPUT"ENTER FILE I.D. (IN QUOTES) DATA IS TO BE SAVED UNDER";F$
1190 CLS
1200 INPUT"NO. OF ENTRIES (MT,YR & AMT = 1 ENTRY)";N
1210 FOR X=1 TO N:PRINT"ENTRY NO.";X
1220 LINEINPUT"ENTER MONTH,YEAR (YOU MAY USE COMMA) ?";Y$(X)
1230 INPUT"ENTER AMOUNT";A(X):CLS
1240 NEXT X
1250 Z=N
1260 '-MOVE TO PRINT ROUTINE
1270 GOTO1430
1280 CLS:GOSUB2130
1290 INPUT"ENTER FILE (IN QUOTES) TO BE READ";F$
1300 PRINT"FILE NAME IS  ";:GOSUB 2300
1310 ON ERROR GOTO 2280
1320 OPEN"I",1,F$
1330 CLOSE
1340 ON ERROR GOTO 0
1350 OPEN"R",1,F$:X=1
1360 FOR I=1 TO LOF(1):GET1,I:FOR E=0TO16
1370 FIELD1,(E*15)AS DUM$,11AS Y$,4AS A$
1380 Y$(X)=Y$: A(X)=CVS(A$)
1390 U$="           ":IF Y$(X)=U$ THEN 1410
1400 X=X+1:NEXT E: NEXT I
1410 CLOSE1 : N=X-1
1420 '-MOVE TO PRINT ROUTINE
1430 C=0:CLS:INPUT"PAUSE AFTER EACH ENTRY PRINTS(YES/NO)";QQ$
1440 CLS:O$="$$###,###.##"
1450 FOR X=1 TO N
1460 PRINT"ENTRY NO. ";X;":     ";Y$(X);"-";USING O$;A(X)
1470 C=C+A(X)
1480 IF QQ$="YES" INPUT"PRESS ENTER";Q:CLS
1490 IF QQ$="NO" THEN FOR Y=1 TO 600:NEXT Y
1500 NEXT X
1510 PRINT:PRINT"TOTAL TO DATE = ";USING O$;C
1520 Z=X-1:N=X-1
1530 PRINT"ANY (MORE) CORRECTIONS/ADDITIONS (YES/NO)?";QQ$=""
1540 INPUT QQ$: IF QQ$="NO" THEN 1640
1550 CLS:PRINT"LAST ENTRY NO. IS  ";X-1;" ON FILE NAMED ";
1360 QQ$="":GOSUB2300
1370 INPUT"ENTER RECORD NO. FOR CORRECTION/ADD";X
1580 PRINT"ADD/RE-ENTER RECORD NO.";X
1590 LINEINPUT"MONTH,YEAR (YOU MAY USE COMMA)"; Y$(X)
1600 INPUT"AMOUNT";A(X)
1610 IF X>N THEN N=X:Z=N
1620 PRINT"FILE WILL NOW PRINT AGAIN"
1630 INPUT"PRESS ENTER";Q: GOTO 1430
1640 CLS:PRINT"DATA IS FROM FILE  ";F$;" - ";
1650 GOSUB 2300
1660 QQ$="":INPUT"DO YOU WANT TO SAVE THIS DATA (YES/NO)";QQ$
1670 IF QQ$="YES" THEN 1700 ELSE 1760
1680 CLS:F$="":GOSUB2130
1690 INPUT"ENTER FILE NAME (IN QUOTES) FOR SAVE";F$
1700 OPEN"R",1,F$:X=1:AA=INT(N/17)+1:FOR I=1 TO AA
1710 FOR E=0 TO 16
1720 FIELD1,(E*15)AS DUM$,11AS Y$,4AS A$
1730 LSET Y$=Y$(X) : RSET A$=MKS$(A(X)): X=X+1
1740 NEXT E: PUT1,I: NEXT I: CLOSE 1
1750 CLS:PRINT"FILE HAS BEEN SAVED  AS  ";F$:QQ$=""
1760 INPUT"DO YOU WANT A  GRAPH (YES/NO)";QQ$
1770 IF QQ$="YES" THEN 110  ELSE QQ$=""
1780 INPUT"DO YOU WANT STATISTICS (YES/NO)";QQ$
1790 IF QQ$="YES" THEN 610  ELSE QQ$="":CLS
1800 CLS:PRINT"PROGRAM CONCLUDED":END
1810 C1=0:CLS:GOTO 1820
1820 PRINT"THIS ROUTINE GETS AM'T WHEN GIVEN THE DATE...."
1830 PRINT"ENTER THE DATE AS IT IS IN THE FILE..."
1840 FOR Y=1 TO 600:NEXT Y
1850 CLS:GOSUB 2130
1860 INPUT"ENTER FILE (IN QUOTES) TO BE READ";F$
1870 LINEINPUT"ENTER DATE (YOU MAY USE A COMMA)  ?";T$
1880 '-BB$=2 & CC$=3 BLANKS TO MAKE T$= 11
```

```
1890 B7=LEN(T$) : BB$="  "; CC$="   "
1900 IF B7<8 THEN PRINT"YOU HAVE NOT FOLLOWED INSTRUCTIONS":END
1910 IF B7>9 THEN PRINT"YOU HAVE NOT FOLLOWED INSTRUCTIONS":END
1920 IF B7 = 8 THEN T$=T$+CC$ : GOTO 1940
1930 IF B7 = 9 THEN T$=T$+BB$ : GOTO 1940
1940 ON ERROR GOTO 2280
1950 QQ$="":CLS:INPUT"PRINTOUT OF TOTAL (YES/NO) ";QQ$
1960 OPEN"I",1,F$:CLOSE
1970 OPEN"R",1,F$ : X=1
1980 CLS
1990 FOR I=1 TO LOF(1) : GET 1,I: FOR E= 0 TO 16
2000 FIELD 1,(E*15) AS DUM$,11 AS Y$,4 AS A$
2010 Y$(X)=Y$ : A(X) = CVS(A$)
2020 O$="$$###,###.##"
2030 IF Y$(X) = T$  THEN 2040 ELSE 2060
2040 PRINTY$(X);"-";USINGO$;A(X)
2050 C1=C1+A(X)
2060 X=X+1: NEXT E: NEXT I: CLOSE 1
2070 IF QQ$= "NO" THEN 2120
2080 LPRINTCHR$(30)
2090 LPRINT F$;" - ";:GOSUB2300
2100 LPRINT T$;" - ";USINGO$;C1
2110 LPRINT "FILE SEARCH COMPLETE":LPRINTCHR$(29)
2120 PRINT"FILE SEARCH COMPLETE":PRINT:PRINT"ROUTINE CONCLUDED":END
2130 GOTO2140
2140 PRINT"E1-HOUSE (T/A/S&W/M)","E13-MEDICAL"
2150 PRINT"E2-MOTELS",,"E14-CLUB"
2160 PRINT"E3-MARKET",,"E15-SCHOOL"
2170 PRINT"E4-ENTERTAIN",,"E16-TRASH"
2180 PRINT"E5-DRUGSTORE",,"E17-MISC"
2190 PRINT"E6-GAS",,"E18-TRIPS(TOTAL)"
2200 PRINT"E7-INSR",,"E19-PHONE"
2210 PRINT"E8-CAR",,"E20-ELEC"
2220 PRINT"E9-CLOTHES/D"
2230 PRINT"E10-CLOTHES/M"
2240 PRINT"E11-CLOTHES/B"
2250 PRINT"E12-RESTAURANTS"
2260 PRINT
2270 RETURN
2280 PRINT"YOU ARE ATTEMPTING TO READ FROM A NONEXISTENT FILE"
2290 PRINT"PROGRAM CONCLUDED":END
2300 IF F$="E1" AND QQ$="YES" THEN LPRINTTAB(15) "HOUSE"
2310 IF F$="E1" THEN PRINT "HOUSE"
2320 IF F$="E2" AND QQ$="YES" THEN LPRINTTAB(15) "MOTELS"
2330 IF F$="E2" THEN PRINT "MOTELS"
2340 IF F$="E3"AND QQ$="YES" THEN LPRINTTAB(15)"SUPER MARKET"
2350 IF F$="E3" THEN PRINT "SUPER MARKET"
2360 IF F$="E4"AND QQ$="YES" THEN LPRINTTAB(15)"ENTERTAIN"
2370 IF F$="E4" THEN PRINT "ENTERTAIN"
2380 IF F$="E5"AND QQ$="YES" THEN LPRINTTAB(15)"DRUGSTORE"
2390 IF F$="E5" THEN PRINT "DRUGSTORE"
2400 IF F$="E6"AND QQ$="YES" THEN LPRINTTAB(15)"GAS"
2410 IF F$="E6" THEN PRINT "GAS"
2420 IF F$="E7"AND QQ$="YES" THEN LPRINTTAB(15)"INSUR."
2430 IF F$="E7" THEN PRINT "INSUR."
2440 IF F$="E8"AND QQ$="YES" THEN LPRINTTAB(15)"CAR"
2450 IF F$="E8" THEN PRINT "CAR"
2460 IF F$="E9"AND QQ$="YES" THEN LPRINTTAB(15)"CLOTHES/D"
2470 IF F$="E9" THEN PRINT "CLOTHES/D"
2480 IF F$="E10"AND QQ$="YES" THEN LPRINTTAB(15)"CLOTHES/M"
2490 IF F$="E10" THEN PRINT "CLOTHES/M"
2500 IF F$="E11"AND QQ$="YES" THEN LPRINTTAB(15)"CLOTHES/B"
2510 IF F$="E11" THEN PRINT "CLOTHES/B"
2520 IF F$="E12"AND QQ$="YES" THEN LPRINTTAB(15)"RESTAURANTS"
2530 IF F$="E12" THEN PRINT "RESTAURANTS"
2540 IF F$="E13"AND QQ$="YES" THEN LPRINTTAB(15)"MEDICAL"
2550 IF F$="E13" THEN PRINT "MEDICAL"
2560 IF F$="E14"AND QQ$="YES" THEN LPRINTTAB(15)"P.V.CLUB"
2570 IF F$="E14" THEN PRINT "P.V.CLUB"
2580 IF F$="E15"AND QQ$="YES" THEN LPRINTTAB(15)"SCHOOL"
2590 IF F$="E15" THEN PRINT "SCHOOL"
2600 IF F$="E16"AND QQ$="YES" THEN LPRINTTAB(15)"TRASH"
2610 IF F$="E16" THEN PRINT "TRASH"
2620 IF F$="E17"AND QQ$="YES" THEN LPRINTTAB(15)"MISC"
2630 IF F$="E17" THEN PRINT "MISC"
2640 IF F$="E18"AND QQ$="YES" THEN LPRINTTAB(15)"TRIPS(TOTAL)"
2650 IF F$="E18" THEN PRINT "TRIPS (TOTAL)"
2660 IF F$="E19"AND QQ$="YES" THEN LPRINTTAB(15)"PHONE"
2670 IF F$="E19" THEN PRINT "PHONE"
2680 IF F$="E20"AND QQ$="YES" THEN LPRINTTAB(15)"ELECTRIC"
2690 IF F$="E20" THEN PRINT "ELECTRIC""
2700 RETURN
2710 CLS
2720 INPUT"HARD COPY (YES/NO)";QQ$
2730 IF QQ$="" THEN 2720  ELSE 2740
2740 IF QQ$="YES" THEN 2750  ELSE 2790
2750 INPUT"DATE (XX/XX/XX)";DATE$
2760 LPRINTCHR$(01):LPRINTCHR$(30)
2770 LPRINTTAB(12)".........";DATE$;"........."
2780 LPRINT
2790 GOTO 2880
2800 REM- BLINK ROUTINE FOR DAILY
2810 CLS
2820 PRINT@400,"INSERT DISK TO BE TOTALED (ENTER)"
```

```
2830 FOR Y=1 TO 100:NEXT Y
2840 B$=INKEY$
2850 IF B$="" THEN 2860  ELSE 2870
2860 CLS: GOTO 2820
2870 RETURN
2880 T$="E":GOSUB 2800
2890 Z=1:SUM=0
2900 C$=STR$(Z)
2910 IF LEN(C$)=2 THEN N=1
2920 IF LEN(C$)=3 THEN N=2
2930 D$= RIGHT$(C$,N)
2940 F$=T$+D$:C1=0
2950 OPEN"R",1,F$:X=1
2960 FOR I=1 TO LOF(1): GET 1,I:FOR E=0 TO 16
2970 FIELD 1,(E*15) AS DUM$, 11 AS Y$, 4 AS A$
2980 U$="           "
2990 R$= Y$: IF R$ = U$ THEN CLOSE 1: GOTO3030
3000 Y$(X)=Y$:A(X)=CVS(A$)
3010 C1=C1+A(X)
3020 X=X+1: NEXT E: NEXT I: CLOSE 1
3030 T(Z)=C1: O$="$$###,##.##":SUM=SUM+T(Z)
3040 IF QQ$="YES" THEN 3050  ELSE 3060
3050 GOSUB2300 :LPRINTTAB(20)F$;"-";USINGO$;T(Z):
3060 PRINTF$;"-";USINGO$;T(Z)
3070 IF Z=20 THEN 3100
3080 Z=Z+1
3090 GOTO 2900
3100 IF QQ$="YES" THEN 3110  ELSE 3120
3110 LPRINT:LPRINTTAB(10)"GRAND TOTAL TO DATE IS";USINGO$;SUM
3120 PRINT:PRINT"GRAND TOTAL TO DATE IS  ";USINGO$;SUM
3130 LPRINTCHR$(02):LPRINTCHR$(28)
3140 END
3150 GOSUB 2130
3160 INPUT"ENTER FILE I.D.(IN QUOTES) DATA IS TO BE SAVED UNDER";F$
3170 CLS: PRINT"ENTER AMOUNTS(ONE AT A TIME) ENDING WITH 0 FOR FILE  ";
     :GOSUB2300
3180 CO=0
3190 FOR X=1 TO 100
3200 INPUT A(X): IF A(X)=0 THEN 3220
3210 CO=CO+A(X):NEXT X
3220 PRINT"TOTAL IS: ";CO
3230 LL9=LEN (F$)
3240 IF LL9=3 THEN VV=2
3250 IF LL9=2 THEN VV=1
3260 Z=VAL(MID$(F$,2,VV))
3270 T(Z)=CO: QP$=""
3280 INPUT"DO YOU WANT TO MAKE ENTRIES FOR OTHER ACCOUNTS  (YES/NO)";QP$
3290 IF QP$="" THEN 3280
3300 IF QP$="YES" THEN 3150  ELSE 3310
3310 LINE INPUT "ENTER MT./YR. FOR SAVE?";Q$
3320 FOR X= 1 TO 150
3330 A(X)=0:Y$(X)=""
3340 NEXT X
3350 CLS:PRINT"SAVING TOTALS"
3360 T$="E": Z=1
3370 IF T(Z)>0 THEN 3380  ELSE Z=Z+1:IFZ>20THEN END ELSE3370
3380 FOR Y= 1TO 50:NEXT Y:C$=STR$(Z)
3390 CLOSE 1
3400 IF LEN (C$)=2 THEN N=1
3410 IF LEN (C$)=3 THEN N=2
3420 D$= RIGHT$(C$,N)
3430 F$=T$+D$
3440 PRINTF$,
3450 '-CHECK TO SEE IF FILE IS ON THE DISK
3460 ON ERROR GOTO 3820
3470 OPEN"I",1,F$:CLOSE 1
3480 ON ERROR GOTO 0
3490 '-DD$=255 BLANKS TO CLEAR BUFFER
3500 DD$="


3510 OPEN"R",1,F$:FIELD 1,255 AS Z$
3520 LSET Z$=DD$:CLOSE 1: FOR Y=1 TO 50 :NEXT Y
3530 '-FILE EXISTS & MUST BE READ BEFORE WRITING TOTAL
3540 OPEN"R",1,F$:X=1:L=LOF(1)
3550 GET1,L:FOR E=0 TO 16
3560 FIELD 1,(E*15) AS DUM$,11 AS Y$,4 AS A$
3570 U$="           "
3580 '-SET FAKE VARIABLE TO SEE IF DATA FIELD IS EMPTY
3590 R$=Y$:IF R$=U$ THEN 3620
3600 Y$(X)=Y$:A(X)=CVS(A$)
3610 X=X+1:NEXT E: GOTO 3750
3620 Y$(X)=Q$: A(X)=T(Z)
3630 CLOSE:FOR Y=1 TO 50:NEXT Y:OPEN"R",1,F$
3640 FIELD 1,255 AS Z$:LSET Z$=DD$ :CLOSE:FOR Y=1 TO 10:NEXT Y
3650 OPEN"R",1,F$
3660 M=1
3670 FOR E=0 TO 16
3680 FIELD 1,(E*15) AS DUM$, 11 AS Y$, 4 AS A$
3690 IF Y$(M)="" THEN PUT 1,L:GOTO3720
3700 LSET Y$=Y$(M): RSET A$=MKS$(A(M))
3710 M=M+1:NEXT E: PUT 1,L
3720 CLOSE 1:FORX=1TO150:Y$(X)="":A(X)=0:NEXTX
3730 IF Z=20 THEN END
```

```
3740 Z=Z+1: GOTO 3370
3750 '-START A NEW SECTOR-LAST READ SHOWED SECTOR FULL-CLEAR BUFFER!
3760 CLOSE 1:FOR Y=1 TO 50: NEXT Y: OPEN"R",1,F$
3770 FIELD 1,255AS Z$:LSETZ$=DD$:CLOSE1:FOR Y=1 TO 10: NEXT Y
3780 OPEN"R",1,F$:FIELD 1,11 AS Y$,4 AS A$,240 AS DUM$
3790 LSET Y$=Q$: RSET A$=MKS$(T(Z))
3800 L=L+1: PUT 1,L
3810 GOTO 3720
3820 '-FILE MUST BE CREATED & TOTAL WRITTEN
3830 '-DD$=255 BLANKS TO CLEAR BUFFER
3840 CLOSE1:OPEN"R",1,F$
3850 FIELD 1,255 AS Z$
3860 DD$="


3870 LSET Z$=DD$
3880 CLOSE 1
3890 OPEN"R",1,F$
3900 FIELD 1,11 AS Y$, 4 AS A$, 240 AS DUM$
3910 LSET Y$=Q$: RSET A$=MKS$(T(Z))
3920 PUT 1,1:CLOSE 1
3930 IF Z=20 THEN END
3940 Z=Z+1
3950 RESUME 3370
```

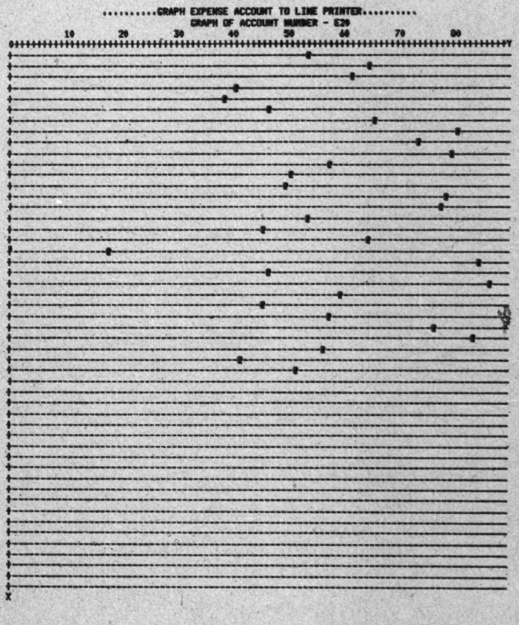
SAMPLE OUTPUT FROM EXPENSES

```
..........07/22/79..........
     HOUSE
          E1-   $1,216.77
     MOTELS
          E2-     $272.30
     SUPER MARKET
          E3-      $79.96
     ENTERTAIN
          E4-     $133.32
     DRUGSTORE
          E5-      $46.66
     GAS
          E6-     $379.25
     INSUR.
          E7-      $68.00
     CAR
          E8-      $89.10
     CLOTHES/D
          E9-     $100.00
     CLOTHES/M
          E10-    $250.00
     CLOTHES/B
          E11-    $300.00
     RESTAURANTS
          E12-    $300.00
     MEDICAL
          E13-      $0.00
     P.V.CLUB
          E14-      $0.00
     SCHOOL
          E15-      $0.00
     TRASH
          E16-      $0.00
     MISC
          E17-      $0.00
     TRIPS( TOTAL )
          E18-    $420.00
     PHONE
          E19-    $134.38
     ELECTRIC
          E20-    $738.12
GRAND TOTAL TO DATE IS  $4,527.86
```

```
10 '-PROGRAM BY BETHANY PRENDERGAST 10129 LEISURE LANE N.
20 '-JAX.,FLA.904-642-1902. WRITTEN FOR TRS-80 LEVEL II,
30 '-48K DISK SYSTEM WITH LINE PRINTER ATTACHED. TO BE RUN
40 '-IN CONJUNCTION WITH EXPENSES PROGRAM.
50 CLEAR(1500):DIMY$(200):DIMA(200):DIMA$(200):DIMT(50)
60 CLS
70 PRINT@400,"TRANSFER/EXP"
80 PRINT:INPUT"WANT HARD COPY OF TOTALS TO DATE";HH$
90 '-PROGRAM BY BETHANY PRENDERGAST 10129 LEISURE LANE N.
100 '-JAX.,FLA.904-642-1902. THIS PROGRAM IS A UTILITY
110 '-ROUTINE TO BE RUN WITH "EXPENSES" FOR THE PURPOSE
120 '-OF INITIALIZING DAILY TRANSACTION DISK AFTER
130 '-TRANSFER OF TOTALS TO MONTHLY DISK
140 GOTO 310
150 REM- BLINK ROUTINE FOR DAILY
160 CLS
170 PRINT@400,"INSERT DAILY DISK(ENTER)"
180 FOR Y=1 TO 100:NEXT Y
190 B$=INKEY$
200 IF B$="" THEN 210   ELSE 220
210 CLS: GOTO 170
220 RETURN
230 REM- BLINK ROUTINE FOR MONTHLY
240 CLS
250 PRINT@400,"INSERT MONTHLY DISK (ENTER)"
260 FOR Y=1 TO 100: NEXT Y
270 B$=INKEY$
280 IF B$="" THEN290   ELSE 300
290 CLS: GOTO250
300 RETURN
310 T$="E":GOSUB 150
320 Z=1
330 C$=STR$(Z)
340 IF LEN(C$)=2 THEN N=1
350 IF LEN(C$)=3 THEN N=2
360 D$= RIGHT$(C$,N)
370 F$=T$+D$:C1=0
380 FOR Y= 1 TO 50:NEXT Y
390 OPEN"R",1,F$:X=1
400 FOR I=1 TO LOF(1): GET 1,I:FOR E=0 TO 16
410 FIELD 1,(E*15) AS DUM$, 11 AS Y$, 4 AS A$
420 U$="           "
430 R$= Y$: IF R$ = U$ THEN CLOSE 1: GOTO470
440 Y$(X)=Y$:A(X)=CVS(A$)
450 C1=C1+A(X)
460 X=X+1: NEXT E: NEXT I: CLOSE 1
470 T(Z)=C1
480 IF HH$="YES" THEN 490   ELSE 500
490 LPRINTCHR$(30):LPRINTF$;"-";T(Z):LPRINTCHR$(29)
500 PRINTF$;"-";T(Z).
510 IF Z=20 THEN GOTO 540
520 Z=Z+1
530 GOTO 330
540 FOR Y=1 TO 50:NEXT Y:GOSUB 230
550 LINE INPUT "ENTER MT./YR. FOR SAVE?";Q$
560 FOR X= 1 TO 150
570 A(X)=0:Y$(X)=""
580 NEXT X
590 CLS:PRINT"SAVING TOTALS"
600 T$="E": Z=1
610 FOR Y= 1TO 50:NEXT Y:C$=STR$(Z)
620 CLOSE 1
630 IF LEN (C$)=2 THEN N=1
640 IF LEN (C$)=3 THEN N=2
650 D$= RIGHT$(C$,N)
660 F$=T$+D$
670 PRINTF$.
680 '-CHECK TO SEE IF FILE IS ON THE DISK
690 ON ERROR GOTO 1480
700 OPEN"I",1,F$:CLOSE 1
710 ON ERROR GOTO 0
720 '-DD$=255 BLANKS TO CLEAR BUFFER
730 DD$="
                                                  "
740 OPEN"R",1,F$:FIELD 1,255 AS Z$
750 LSET Z$=DD$:CLOSE 1: FOR Y=1 TO 50 :NEXT Y
760 '-FILE EXISTS & MUST BE READ BEFORE WRITING TOTAL
770 OPEN"R",1,F$:X=1:L=LOF(1)
780 GET1,L:FOR E=0 TO 16
790 FIELD 1,(E*15) AS DUM$,11 AS Y$,4 AS A$
800 U$="           "
810 '-SET FAKE VARIABLE TO SEE IF DATA FIELD IS EMPTY
820 R$=Y$:IF R$=U$ THEN 850
830 Y$(X)=Y$:A(X)=CVS(A$)
840 X=X+1:NEXT E: GOTO 980
850 Y$(X)=Q$: A(X)=T(Z)
860 CLOSE:FOR Y=1 TO 50:NEXT Y:OPEN"R",1,F$
870 FIELD 1,255 AS Z$:LSET Z$=DD$ :CLOSE:FOR Y=1 TO 10:NEXT Y
880 OPEN"R",1,F$
890 M=1
900 FOR E=0 TO 16
910 FIELD 1,(E*15) AS DUM$, 11 AS Y$, 4 AS A$
920 IF Y$(M)="" THEN PUT 1,L:GOTO950
930 LSET Y$=Y$(M): RSET A$=MKS$(A(M))
940 M=M+1:NEXT E: PUT 1,L
950 CLOSE 1:FORX=1TO150:Y$(X)="":A(X)=0:NEXTX
960 IF Z=20 THEN 1050
970 Z=Z+1: GOTO 610
980 '-START A NEW SECTOR BECAUSE READ SHOWS LAST SECTOR FULL - CLEAR. BUFFER
990 CLOSE 1:FOR Y=1 TO 50: NEXT Y: OPEN"R",1,F$
1000 FIELD 1,255AS Z$:LSETZ$=DD$:CLOSE1:FOR Y=1 TO 10: NEXT Y
1010 OPEN"R",1,F$:FIELD 1,11 AS Y$,4 AS A$,240 AS DUM$
1020 LSET Y$=Q$: RSET A$=MKS$(T(Z))
1030 L=L+1: PUT 1,L
1040 GOTO 950
1050 CLS:PRINT"DO YOU WISH TO KILL AND REINITIALIZE OLD DAILY FILES (YES/NO
1060 INPUT QQ$
1070 IF QQ$="YES" THEN 1100
1080 IF QQ$="NO" THEN PRINT"PROGRAM CONCLUDED":END
1090 IF QQ$="" THEN 1050
```

```
1100 GOSUB 170
1110 CLS:PRINT@400," KILLING FILES"
1120 T$="E"; Z=1
1130 C$=STR$(Z)
1140 IF LEN (C$)=2 THEN N=1
1150 IF LEN (C$)=3 THEN N=2
1160 D$= RIGHT$(C$,N)
1170 F$=T$+D$
1180 PRINTF$,
1190 KILL F$
1200 FOR Y=1 TO 50 : NEXT Y
1210 IF Z= 20 THEN 1250
1220 Z=Z+1
1230 GOTO 1130
1240 '-REINITIALIZE FILES FOR NEW MONTH
1250 FOR Y= 1 TO 50 : NEXT Y
1260 CLS: LINE INPUT"ENTER MT./YR.(USE COMMA)
     FOR FIRST ENTRY ON NEW FILES?";Y$(X)
1270 CLS: PRINT@400," INITIALIZING FILES"
1280 T$="E":Z=1:A(X)=0
1290 C$=STR$(Z)
1300 IF LEN(C$)=2 THEN N=1
1310 IF LEN (C$)=3 THEN N=2
1320 D$=RIGHT$(C$,N)
1330 F$=T$+D$
1340 PRINTF$,
1350 '-FILLER FOR BUFFER
1360 V$="


                                  "
1370 OPEN"R",1,F$
1380 FIELD 1,11 AS Y$,4 AS A$,240 AS DUM$
1390 LSET Y$=Y$(X): RSET A$= MKS$(A(X))
1400 LSET DUM$=V$
1410 PUT 1,1: CLOSE1
1420 FOR Y=1 TO 50: NEXT Y
1430 IF Z= 20 THEN 1460
1440 Z=Z+1
1450 GOTO 1290
1460 CLS:PRINT" FILES HAVE BEEN INITIALIZED AS  ";Y$(X)
1470 PRINT:PRINT"PROGRAM CONCLUDED": END
1480 '-FILE MUST BE CREATED & TOTAL WRITTEN
1490 '-DD$=255 BLANKS TO CLEAR BUFFER
1500 CLOSE1:OPEN"R",1,F$
1510 FIELD 1,255 AS Z$
1520 DD$="
     "
1530 LSET Z$=DD$
1540 CLOSE 1
1550 OPEN"R",1,F$
1560 FIELD 1,11 AS Y$, 4 AS A$, 240 AS DUM$
1570 LSET Y$=G$: RSET A$=MKS$(T(Z))
1580 PUT 1,1:CLOSE 1
1590 IF Z=20 THEN 1050
1600 Z=Z+1
1610 RESUME 610
```



```
10 '-PROGRAM LISTING FOR CREATIVE COMPUTING - 07/15/79
20 '-PROGRAM BY BETHANY PRENDERGAST 904/642-1902 TO BE RUN IN
30 '-CONJUNCTION WITH EXPENSES PROGRAM.
40 CLS:CLEAR(5000):DIM Y$(200):DIM A(120): DIM A$(120)
50 LPRINTCHR$(30)
60 LPRINT"                    ..........GRAPH EXPENSE ACCOUNT TO LINE PRINTER.........."
70 PRINT"          GRAPH/EXP PROGRAM"
80 INPUT"ENTER NO.OF LINES ON X-AXIS DESIRED (54 TO A PAGE)";LL
90 INPUT"ENTER FILE (IN QUOTES) TO BE READ";F$
100 LPRINT"                                         GRAPH OF ACCOUNT NUMBER - ";F$
110 OPEN"R",1,F$:X=1
120 FOR I=1 TO LOF(1):GET 1,I:FOR E=0 TO 16
130 FIELD1, (E*15)AS DUM$,11AS Y$,4AS A$
140 Y$(X)=Y$:A(X)=CVS(A$)
150 U$="           ":IF Y$(X)=U$ THEN 170
160 X=X+1:NEXT E:NEXT I
170 CLOSE1:N=X-1
180 PRINT"WORKING"
190 Z=N
200 '-CHANGE Y VALUES TO INTEGERS
210 FOR X= 1 TO Z
220 A(X)=INT(A(X)+.5)
230 PRINTA(X);
240 NEXT X
250 '-CHECK THAT VALUES OF Y NOT > 90 FOR LPRINT
260 FOR X = 1 TO Z
270 IF A(X)>90 THEN 290  ELSE NEXT X
280 GOTO410
290 '-SCALE DOWN Y TO PERMIT LPRINT
300 IF A(X)> 90 THEN D=2
310 IF A(X)>180 THEN D=4
320 IF A(X)>360 THEN D=8
330 IF A(X)>720 THEN D=10
340 IF A(X)>900 THEN D=20
350 IF A(X)>1800 THEN 860
360 IF D>0 THEN LPRINT          ( Y AXIS VALUES HAVE BEEN DIVIDED BY ";D;" )"
370 FOR X= 1 TO Z
380 A(X)=INT((A(X)+.5)/D)
390 '- GO BACK AND CHECK ALL NUMBERS AGAIN FOR SCALE
400 NEXT X : GOTO 260
410 '-DETERMINE WHERE ON LINE Y FALLS
420 FOR I= 1 TO Z
430 '- SET UP A$(I) TO EQUAL NO. OF BLANKS = TO A(I)
440 FOR L=1 TO A(I)
450 S$=S$+"."
460 NEXT L
470 A$(I)=S$
480 PRINTA$(I)
490 S$=""
500 NEXT I
510 CLS:PRINT"COMPUTING GRAPH FOR LINE PRINTER"
520 LPRINTCHR$(30);"     10        20        30        40        50
    60        7(       80"
530 '-A$(I) NOW HAS NO OF BLANK'S CORRESPONDING TO INTEGER VALUE OF A(X)
540 '-THIS PROGRAM GRAPHS NUMERIC DATA TO THE PRINTER
550 '-SET STRING OF +"+" SEPARATED BY BLANKS
 560 T$="0+++"
 570 FOR X= 1 TO 21
 580 T$=T$+"++++"
 590 NEXT X
 600 '-SET UP Y AXIS FOR PRINT
 610 T$=T$+"++Y"
 620 LPRINTT$
 630 '-SET STRING OF "-"'S AND THEN PUT "@" WHERE IT BELONGS ON LINE
 640 FOR X = 1 TO Z
 650 L$="+---"
 660 FOR Y= 1 TO 22
 670 L$=L$+"----"
 680 NEXT Y
 690 P=LEN(A$(X))
 700 IF P=0 THEN  790
 710 A$=LEFT$(L$,(P))
 720 P1=91-(P+1)
 730 B$=RIGHT$(L$,P1)
 740 P1=0
 750 L$=A$+"@"+B$
 760 LPRINT L$
 770 L$="":A$="":B$=""
 780 GOTO820
 790 B$=RIGHT$(L$,83)
 800 L$="@"+B$
 810 GOTO 760
 820 NEXT X
 830 IF Z<60 THEN GOTO 880
 840 LPRINT"X":LPRINTCHR$(28)
 850 END
 860 CLS:PRINT"Y POINTS ARE> 1800 , PLEASE SCALE DOWN & RERUN !"
 870 END
 880 FOR X= 1 TO (LL-Z)
 890 W$="+"
 900 FOR Q= 1 TO 9
 910 W$=W$+"----------"
 920 NEXT Q
 930 LPRINT W$
 940 NEXT X
 950 LPRINT"X"
 960 LPRINTCHR$(28)
 970 END
```

Stock Market Analysis

Philip R. Humbaugh

Note: This program listing was made by running the Level I to Level II conversion program. To convert back to Level I, change the array A( ) to @. To run in Level II, add a dimension statement that reads: DIM A(233).

Introduction

For years Wall Street firms have used large scale computers to forecast the trend of the stock market and to aid in individual stock selection. The advent of small home computers has led the individual investor to attempt to partially replicate such large systems with limited storage capacity and computing power.

The individual investor with little time for independent study has usually relied on the advice of his broker, tips from associates or brief fundamental analyses. There is evidence that even the best advice is not very good. Speaking of some popular advisory services, Shepard has said, "The empirical evidence manifestly refutes the hypothesis that these seven sources of investment guidance afforded superior insight into the stock market between 1966 and 1971."

There is a need, therefore, for a system of stock market advice to service the individual investor. Small home computers make it possible for him to control and understand the input and output to such a system.

System Requirements

To be used, the stock market analysis system must meet certain requirements.

1. It must be simple. Stock market systems can be extremely complex. Yet, the systems that are used and appreciated are those which are easily understood.

2. It must not be time consuming. The system should use a small set of readily available statistics that may be input directly into the system.

3. The system should be more than can be easily done by hand. That is, the computer should serve some function other than automating a simple calculation.

4. The system should make decisions. Rather than compute derived statistics requiring human judgement, the computer should use pre-programmed decision rules to give explicit investment advice. Levin, president of an advisory firm using large-scale computers has said "Anyone who says stock market forecasting is an art has an ego problem." This would suggest the existence of indicators of future market performance.

5. It should be technically sound. That is, the indicators and decision rules should be more than artifacts.

6. It should be verifiable. After the fact, it should be possible to determine whether the advice was correct.

Fundamental vs. Technical Analysis

Even with these requirements there are still choices. Fundamental analysis uses economic indicators, price/earning ratios, earnings growth and assessment of management as indicators of the underlying value of a stock and its investment potential. Technical analysis, on the other hand, is concerned only with current market trends and cycles. The current price is said to integrate all the complex factors and, therefore, its movement is all that matters.

There is often no relationship between the price of a stock and the fundamental parameters of the company underlying the stock.

There is often no relationship between the price of a stock and the fundamental parameters of the company underlying the stock. These parameters, in a general way, can provide information about the attractiveness of the stock to other investors but technical analysis will usually be required to determine when to buy. Blackman has said that "Every major move in every listed stock is shown by charts."

The techniques described herein, therefore, presuppose that a list of stocks whose fundamentals appeal to the investor has been drawn up. Charts on all these stocks are maintained and interpreted by the pre-programmed decision rules. Trend statistics are displayed but specific advice following from the decision rules is also shown. Therefore, while fundamental analysis is not overlooked, the primary focus of this system, called the Personal Stock Advisor, is to use technical analysis to point out opportune buying and selling points.

Trend Equations

Much of the philosophy of this work comes from Zahorchak and Blackman. The latter has said that, in the stock market, "a trend will continue in the same direction until something important forces a change." The key is that one need not predict the absolute lowest price to buy or the highest price to sell in order to make a profit. One may wait until the trend is signalled by the charts and then complete the transaction.

The general trend of the market can be assessed using an overall market index, such as the Dow Jones Index, New York Stock Exchange Index or the Standard & Poor 500 Stock Index. Although any of these might do, because they generally represent the market and are readily available, the S&P 500 was chosen because it was felt to combine a reasonable balance of representativeness and volatility.

Short, medium and long term trend records are kept on S&P 500 using exponentially weighted moving averages on a weekly basis. If A_t represents the observed index at time t, then the following formulas show how these averages are updated.

(4.1) Short Term

$$S_{t+1} = .667S_t + .333A_{t+1}$$

(4.2) Medium Term

$$M_{t+1} = .875M_t + .125A_{t+1}$$

(4.3) Long Term

$$L_{t+1} = .950L_t + .050A_{t+1}$$

The short, medium and long term trends represent approximately 5, 15 and 40 week moving averages. It is the

Stock Market, cont'd...

relationship among these trends which provide clues to market direction.

One other statistic is felt to be important in tracking the market as a whole. The number of stocks increasing in price during the week (advances) and the number declining in price (declines). A medium term moving average of the cumulative sum of the differences is used for the advance/decline index.

$$(4.4) \quad C_t = \sum_{i=1}^{t} (\text{Advances}—\text{Declines})_i$$

$$(4.5) \quad I_{t+1} = .875C_t + .125C_{t+1}$$

The only number input for each stock is the closing weekly price. Short, medium and long term trends using equations (4.1), (4.2) and (4.3) are maintained for individual stocks as they are for the market.

There is a need for a system of stock market advice to service the individual investor.

Decision Rules

There are eleven basic decision rules used to decipher the patterns in the general market trends. They are not proven to be optimal yet they provide a useful heuristic. Some of these rules were suggested by Zahorchak while others represent the piecing together of the thoughts of many. These rules do not cover all possible events because some patterns may simply not be clear enough.

Because the storage capacity of the computer being used was limited to 4000 characters, the number of weeks of data which could be used to determine the trend was restricted to three. Therefore, a trend is defined as two consecutive weeks in the same direction.

Two examples of the decision rules should serve to illustrate their use. The most obvious rule is: if the long term trend and the advance/decline index trend is up and the short and medium term averages are higher than the long term average, stay fully invested. A less obvious rule is: if the long term trend and the advance/decline index trend are down, the medium term average is less than the long term average, but the short term average is greater than the long term average this is a bullish sign.

The seven decision rules for individual stocks concern their trends but may also involve the trend of the general market. The simplest rule is: if the long term trend is up (down) and the medium term and short term averages are above (below) the long term average hold (avoid) the stock regardless of the general market trend. Another rule is: if the long term trend is up, the medium term average is higher than the long term average and the short term average is below the long term average, buy the stock if the general market trend is favorable and sell if it is not.

The system clearly identified some winners.

The Results of Its Use

The system was programmed and loaded with five weeks of data before records of its performance began to be collected. At the time this paper is being written only 25 weeks of data have been registered. This is too short a time to completely evaluate such a system. Furthermore, during this period the market itself remained virtually unchanged, rising only 3% over the span (January 12 to June 29, 1979) and never changing more than 3% from its initial value. This made it very difficult to assess whether the system can predict stock price performance.

Arnold's Follies
the scene opens onto a well lit room with, ARNOLD ZIEBACK, ace programmer finishing up on a NEW program..........
apple II
ARNOLD?
his concentration is broken for a brief moment... Unknown to ARNOLD, he will do something that many others have done in the past.......
GIMME A SECOND MOM... ONLY ONE MORE thing MUMBLE mumble....
apple II
ARNOLD!!!
as ARNOLD's fingers, frantically, fly across the keyboard..... he is about to cross over into obscurity..........
FLAP! FLAP! FLAP!
apple
FLAP!
FLAP!
...only missed it by that much!! ..one silly centimeter.... RESET!!!
BeeP!
FLAP! FLUTTER?
REPT
RETURN
SHIFT
he has hit RESET, instead of hitting RETURN.... Alas, if he only knew about ta da........ResetGuard™........FIN
NO! NO! NO! NOT THAT
ARNOLD!!!
SOB!
apple II
ResetGuard™ is the solution to the problem of accidentally hitting the RESET key. With ResetGuard, you must press the RESET key TWICE in one second to RESET the computer!!! FINALLY
SOFTAPE
master charge
VISA

ORDER FORM

Yes I'm tired of hitting reset at the wrong time.

Please send me ___________ reset guards *$34.95 ea.

Name ______________________

Address ______________________

City ______________________

State ____________ Zip ____________

10432 Burbank Boulevard • North Hollywood, California 91601

CIRCLE 187 ON READER SERVICE CARD

Stock Market, cont'd...

Except for two consecutive weeks in March and five weeks in May and June, the system has indicated a positive trend to the market. Every signal has been to stay fully invested, except for the weeks indicated which were inconclusive. This would seem to be the correct indication since the market did rise 3% during this time.

Twenty-two individual stocks were also followed during this time period. These stocks do not represent a random sample but were chosen to represent companies with good fundamentals in a range of industries. In practice it would be desirable to follow a larger set of stocks, perhaps 100 or so, in order to be sure to find some stocks worthy of consideration.

In the analysis which follows it should be remembered that the system can be hampered by start up conditions. For example, the long term average which is supposed to represent a 40-week average had only five weeks initially and even now has only 30 weeks of information. This will affect the system in some indeterminate way. Additionally, no assessment has been made in the use of the system for short selling, i.e. betting a stock will go down. Additional profits could perhaps be made there.

The 22 stocks were divided into four groups based upon the actions taken during the 25-week test period.

Group I	Stocks bought and sold during the period
American Air	- 9%
Boeing	- 7
National Gypsum	- 1
General Foods	- 7
Caterpillar	- 4

In each case a position was taken based upon apparently favorable trends. In a week or two it became clear that these trends would not materialize and sell signal was flashed. This demonstrates the systems ability to limit losses.

Group II	Stocks bought and still held at the end of the period
Campbell Red Lake	+ 20%
Fedders	+ 46
Household Finance	+ 6
Kerr McGee	+ 18
Lone Star	+ 6
Rollins	+ 10

All stocks in this group have out-performed the market.

Group III	Stocks generally avoided or inconclusive during the period
Beatrice Foods	- 7%
Corning	+ 1
Holiday Inn	+ 1
Johnson & Johnson	- 6
McDonalds	0
TWC	+ 3

These percentages reflect the percent change between the beginning and end of the period. These stocks generally underperformed the market or gave patterns undecipherable by the system.

Group IV	Stocks consistently held throughout the period
Bunker Ramo	+ 29%
Crane	+ 13
Hecla	+ 133
Int'l Harvester	+ 5
Louisiana Land	+ 56

Some spectacular gains were recorded in this group. The system clearly identified some winners but included two stocks which have yet to perform spectacularly.

10.000.000
6%
1

Summary

A set of system requirements was developed for a personal stock advisory system using a home computer. A system satisfying those requirements was developed and checked over a sixteen week time span. The results were encouraging because losses were limited while some outstanding performers were identified. The analysis was hampered by the limited set of stocks, the short time period and the lack of conclusive direction by the market.

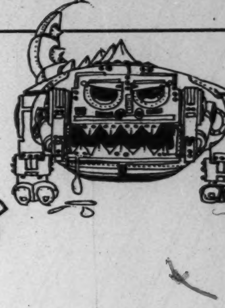
It is planned to continue to evaluate the performance over several market turns. At the same time each decision rule will be critically studied for its ability to identify trends. ☐

References

1. Blackman, R. *"Follow the Leaders,"* Simon and Schuster (1978).
2. Brennan, P.J., *"The Computers' Picks for 1979,"* Financial World, January 15, 1979.
3. Felsen, J., *"Cybernetic Approach to Stock Market Analysis,"* Exposition, 1975.
4. ______________, *"Low-Cost, Personal Computer-Based Investment Decision Systems,"* CDS, 1978.
5. Shephard, L., *"How Good is Investment Advice for Individuals?,"* The Journal of Portfolio Management, Winter 1977.
6. Zahorchak, M.G., *"The Art of Low Risk Investing,"* Van Nostrand Reinhold, 1972.

SOL-20

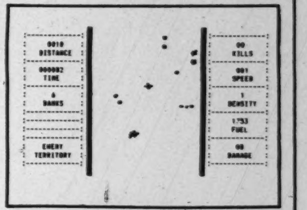
Here's your chance to capture the mythological Wumpus. The dreaded Superbats and bottomless pits make wumpus hunting a risky affair as you scour the underground caves of his lair. Bagging the Wumpus wins the game but if you accidentally stumble in to his cave, the Wumpus will enjoy a tasty dinner of sauteed computer freak. (Strategy Games)



Sensational Software for the Sol-20

Space Games-4

Space Games
CS-8003, 32K, $7.95



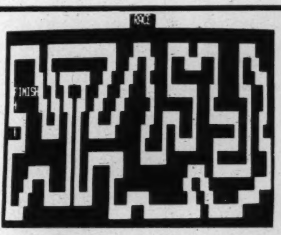
Asteroid Your torpedoes are your only defense against deadly and accurate aliens as you navigate through asteroids, stars, and hostile space meanies. **Lunar** You must master the horizontal motion and speed of descent of your craft to land safely among the lunar craters. **Star Wars** Take an X-wing fighter into combat and save the rebel base camp by lining up the fighters in your sights and zapping them with lasers. **Romulan** Your sensors pierce the Romulan cloaking device but are a dangerous energy drain . . . watch out! The hedonous Romulans could be anywhere!

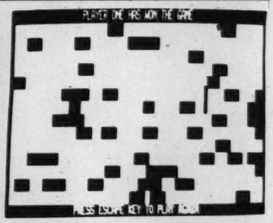
Reading Comprehension

Reading Comprehension
CS-8201, 20K, $50.00

An entertaining and effective method of developing reading comprehension skills. Teachers determine the topics, and difficulty, of short stories and accompanying multiple choice questions. A sample story, quiz, and easy-to-use 32 page instruction manual are included (requires Cassette Extended Basic).

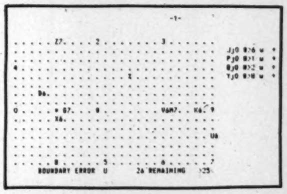
Strategy Games





Strategy Games
CS-8004, 32K, $7.95
Wumpus-1 and Wumpus-2 If you master the dodecahedronal cave network in Wumpus 1, you can tackle the five different caves of Wumpus 2, or you can design you own. **Trap** As you trail around the board at a quickening pace your object is to encircle and trap your opponent before he traps you. **Hammurabi** As ruler you cope with bad weather, rats in the grain bin, and restless peasants.

Air Traffic Controller



Air Traffic Controller
CS-8001, 16K, $7.95
This realistic simulation puts you in the chair of an air traffic controller, responsible for 26 jet and propeller aircraft as they enter and leave your 15 x 25 mile airspace. Under the ever present threat of collision, you give orders to change altitude, maintain a holding pattern, clear for approach, and land at two airports. This favorite of the Creative Computing Staff was written by an Air Traffic Controller.

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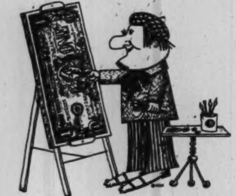
```
10 CLS:PRINT:PRINT"UPDATE AND STOCK INITIALIZATION PROGRAM":PRINT
20 DATAAMERICAN AIR.,BOEING,BEATRICE,BUNKER RAMO,CRANE
30 DATACORNING,CAMPBELL RD-LAKE,CATERPILLAR,FEDDERS
40 DATAGENERAL FOODS,HOLIDAY INN,HECLA,HOUSEHOLD FINANCE
50 DATAINT. HARVESTER,JOHNSON & JOHN.,KERR MCGEE
60 DATALONE STAR,LOUISIANA LAND,MCDONALDS,NATIONAL GYPSUM
70 DATAROLLINS,TWC
100 K=22
110 PRINT"REWIND TAPE FROM PREVIOUS WEEK"
120 PRINT"LOAD INTO RECORDER"
130 PRINT"THEN PRESS RECORDER'S PLAY KEY"
140 INPUT"PRESS ENTER WHEN READY";A$
145 INPUT#-1,X
150 INPUT#-1,M
160 IFM=KGOTO200
170 PRINT"PROGRAM ALLOWS FOR";K;" STOCKS"
180 PRINT"WHILE FILE CONTAINS DATA FOR";M;" STOCKS"
190 PRINT"FIX PROGRAM BEFORE PROCEEDING":END
200 INPUT#-1,A(0),A(1),A(2),A(3),A(4),A(5),A(6)
205 INPUT#-1,A(7),A(8),A(9),A(10),A(11),A(12),A(13)
210 PRINT"GENERAL MARKET INFO"
220 INPUT"ADVANCES,DECLINES,S&P 500";A,D,E
230 PRINTA,D,E
240 Y=1:N=0:INPUT"ANY CHANGES";X
250 IFX=1GOTO220
260 A(0)=A(0)+A-D:A(3)=A(2):A(2)=A(1)
270 A(1)=.875*A(2)+.125*A(0)
280 A(4)=E:A(7)=A(6):A(6)=A(5)
290 A(5)=INT(66.67*A(6)+33.33*E)/100
300 A(10)=A(9):A(9)=A(8)
310 A(8)=INT(87.5*A(9)+12.5*E)/100
320 A(13)=A(12):A(12)=A(11)
330 A(11)=INT(95*A(12)+5*E)/100
340 CLS:PRINT
350 FORJ=0TO13:PRINTJ,A(J):NEXTJ
360 INPUT"ANY CHANGES";X
370 IFX=0GOTO500
380 INPUT"J,A(J)";J,A(J)
390 GOTO340
500 FORI=1TOK
505 L=10*I+3:READA$
520 INPUT#-1,B$,A(L+1),A(L+2),A(L+3),A(L+4),A(L+5)
525 INPUT#-1,A(L+6),A(L+7),A(L+8),A(L+9),A(L+10)
530 CLS:PRINT:PRINT"STOCK ",A$
540 PRINT"FILE ";B$
550 INPUT"THIS WEEK'S PRICE";P
560 PRINTP:INPUT"ANY CHANGES";X
570 IFX=1GOTO550
610 A(L+1)=P:A(L+4)=A(L+3):A(L+3)=A(L+2)
620 A(L+2)=INT(66.67*A(L+3)+33.33*P)/100
630 A(L+7)=A(L+6):A(L+6)=A(L+5)
640 A(L+5)=INT(87.5*A(L+6)+12.5*P)/100
650 A(L+10)=A(L+9):A(L+9)=A(L+8)
660 A(L+8)=INT(95*A(L+8)+5*P)/100
670 CLS:PRINT:PRINT"STOCK: ";A$
680 FORJ=1TO10:PRINTJ,A(L+J):NEXTJ
690 INPUT"ANY CHANGES";X
700 IFX=0GOTO800
710 INPUT"J,A(J)";J,A(L+J)
720 GOTO670
800 NEXTI
810 PRINT"THAT'S ALL THE STOCKS ON RECORD"
820 INPUT"DO YOU WISH TO ADD ANOTHER STOCK";X
830 IFX=0GOTO1000
840 PRINT"CHANGE LINE 100 AND ADD NAMES TO DATA STATEMENT"
850 PRINT"TYPE RUN900 WHEN READY TO CONTINUE":END
900 FORI=M+1TOK
910 READA$
920 INPUT"CURRENT PRICE";X
930 L=10*I+3:FORJ=L+1TOL+10:A(J)=X:NEXTJ
940 NEXTI
1000 PRINT"PUT A FRESH TAPE INTO RECORDER"
1010 PRINT"PRESS RECORD AND PLAY KEYS"
1020 INPUT"PRESS ENTER WHEN READY";A$
1025 PRINT#-1,X
1030 PRINT#-1,K
1040 PRINT#-1,A(0);",";A(1);",";A(2);",";A(3);",";A(4);",";A(5);",
     ";A(6)
1050 PRINT#-1,A(7);",";A(8);",";A(9);",";A(10);",";A(11);",";A(12)
     ;",";A(13)
1060 RESTORE
1100 FORI=1TOK
1105 READA$
1110 L=10*I+3
1120 PRINT#-1,A$;",";A(L+1);",";A(L+2);",";A(L+3);",";A(L+4);",";
     A(L+5)
1130 PRINT#-1,A(L+6);",";A(L+7);",";A(L+8);",";A(L+9);",";A(L+10)
1140 NEXTI
1200 PRINT"ALL DATA HAVE BEEN PUT ON TAPE"
1210 END
```



```
5 PRINT"LOAD TAPE"
10 INPUT"PRESS ENTER WHEN READY";A$
20 M=22
22 DATAAMERICAN AIR.,BOEING,BEATRICE,BUNKER RAMO,CRANE
30 DATACORNING,CAMPBELL RD-LAKE,CATERPILLAR,FEDDERS
40 DATAGENERAL FOODS,HOLIDAY INN,HECLA,HOUSEHOLD FINANCE
50 DATAINT. HARVESTER,JOHNSON & JOHN.,KERR MCGEE
60 DATALONE STAR,LOUISIANA LAND,MCDONALDS,NATIONAL GYPSUM
70 DATAROLLINS,TWA
72 INPUT"A,D,E";A,D,E
80 FORJ=0TO3:A(J)=A-D:NEXTJ
90 FORJ=4TO13:A(J)=E:NEXTJ
100 PRINT#-1,M
110 PRINT#-1,A(0);",";A(1);",";A(2);",";A(3);",";A(4);",";A(5);",";A(6)
120 PRINT#-1,A(7);",";A(8);",";A(9);",";A(10);",";A(11);",";A(12);",";A(13)
130 FORK=1TO22
140 READA$
150 PRINT"INPUT PRICE OF ";A$;" ";:INPUTX
160 FORJ=1TO10:A(J)=X:NEXTJ
170 PRINT#-1,A$;",";A(1);",";A(2);",";A(3);",";A(4);",";A(5)
180 PRINT#-1,A(6);",";A(7);",";A(8);",";A(9);",";A(10)
190 NEXTK
200 END
```

```
5 CLS:PRINT:PRINTTAB(21),"PERSONAL STOCK ADVISOR"
10 PRINT:PRINT"REWIND DATA TAPE"
20 PRINT"LOAD TAPE INTO RECORDER"
30 PRINT"THEN PRESS RECORDER'S PLAY KEY"
40 INPUT"PRESS ENTER WHEN READY";A$
45 INPUT#-1,X
50 INPUT#-1,M
60 CLS:PRINTTAB(21),"PERSONAL STOCK ADVISOR"
70 PRINT:PRINTTAB(20),"GENERAL MARKET TRENDS"
80 PRINT:PRINTTAB(12),"THIS",TAB(24),"LAST",TAB(36),"WEEK"
90 PRINTTAB(12),"WEEK",TAB(24),"WEEK",TAB(36),"BEFORE",TAB(48),"TREND"
100 INPUT#-1,A(0),A(1),A(2),A(3),A(4),A(5),A(6)
110 INPUT#-1,A(7),A(8),A(9),A(10),A(11),A(12),A(13)
120 X=1:GOSUB2000:A=Y
125 FORJ=1TO3:A(J)=INT(A(J)):NEXTJ
130 PRINT"A/D INDEX";TAB(12);A(1);TAB(24);A(2);TAB(36);A(3);TAB(48);
140 GOSUB3000
150 PRINT"S & P 500"
160 X=5:GOSUB2000
170 PRINT"  SHORT";TAB(12);A(5);TAB(24);A(6);TAB(36);A(7);TAB(48);
180 GOSUB3000
190 X=8:GOSUB2000
200 PRINT"  MEDIUM",TAB(12);A(8);TAB(24);A(9),TAB(36);A(10),TAB(48);
210 GOSUB3000
220 X=11:GOSUB2000:L=Y
230 PRINT"  LONG";TAB(12);A(11);TAB(24);A(12);TAB(36);A(13);TAB(48);
240 GOSUB3000
250 PRINT:PRINT"CURRENT LEVEL";A(4)
260 PRINT:PRINT"INDICATION: ";
300 IF(A=0)+(L=0)PRINT"INCONCLUSIVE":B=0:GOTO500
310 IF(A=1)*(L=1)*(A(8)>A(11))PRINT"STAY FULLY INVESTED(BULL)":B=1:GOTO500
320 IF(A=1)*(L=1)*(A(8)<A(11))PRINT"UNCERTAIN--DON'T BUY":B=0:GOTO500
330 IF(A=-1)*(L=-1)*(A(8)>A(11))PRINT"UNCERTAIN--DON'T BUY":B=0:GOTO500
340 IF(A=-1)*(L=1)*(A(8)<A(11))PRINT"DON'T BUY(BEAR)":B=-1:GOTO500
350 IF(A=-1)*(L=-1)*(A(5)<A(11))*(A(8)<A(11))PRINT"DON'T BUY":B=-1:GOTO500
360 IF(A=-1)*(L=-1)*(A(5)>A(11))*(A(8)<A(11))PRINT"BUY":B=1:GOTO500
370 IF(A=1)*(L=-1)*(A(5)<A(11))*(A(8)<A(11))PRINT"BUY":B-1:GOTO500
380 IF(A=1)*(L=-1)*(A(5)>A(11))*(A(8)<A(11))PRINT"BUY":P=1:GOTO500
390 IF(A=1)*(L=-1)*(A(5)>A(11))*(A(8)>A(11))PRINT"BUY":B=1:GOTO500
400 B=0:PRINT"INCONCLUSIVE"
500 INPUT"PRESS ENTER TO CONTINUE";A$
600 FORK=1TOM
610 INPUT#-1,A$,A(14),A(15),A(16),A(17),A(18)
620 INPUT#-1,A(19),A(20),A(21),A(22),A(23)
630 CLS:PRINTTAB(21),"PERSONAL STOCK ADVISOR"
640 PRINT:PRINTTAB(20),"STOCK: ";A$
650 PRINT:PRINTTAB(12),"THIS",TAB(24),"LAST",TAB(36),"WEEK"
660 PRINTTAB(12),"WEEK",TAB(24),"WEEK",TAB(36),"BEFORE",TAB(48),"TREND"
670 X=15:GOSUB2000
680 PRINT"  SHORT";TAB(12);A(15);TAB(24);A(16);TAB(36);A(17);TAB(48);
690 GOSUB3000
700 X=18:GOSUB2000
710 PRINT"  MEDIUM";TAB(12);A(18);TAB(24);A(19);TAB(36);A(20);TAB(48);
720 GOSUB3000
730 X=21:GOSUB2000:L=Y
740 PRINT"  LONG";TAB(12);A(21);TAB(24);A(22);TAB(36);A(23);TAB(48);
750 GOSUB3000
760 PRINT:PRINT"CURRENT PRICE: ";A(14)
770 R=INT(100*(A(11)/A(21))*(A(15)/A(5))+.5)
780 PRINT:PRINT"RELATIVE STRENGTH";R:PRINT
790 PRINT"RECOMMENDATION: ";
800 IF(L=1)*(A(15)>A(21))*(A(18)>A(21))PRINT"HOLD STOCK":GOTO1000
810 IF(L=-1)*(A(15)<A(21))*(A(18)<A(21))PRINT"AVOID STOCK":GOTO1000
820 IFB=0PRINT"WAIT FOR CLEARER MARKET TRENDS":GOTO1000
830 IF(B=1)*(L=1)*(A(18)>A(21))*(A(15)<A(18))PRINT"HOLD STOCK":GOTO1000
840 IF(B=-1)*(L=1)*(A(18)>A(21))*(A(15)<A(18))PRINT"SELL":GOTO1000
850 IF(B=1)*(L=1)*(A(18)>A(21))*(A(15)<A(21))PRINT"HOLD":GOTO1000
860 IF(B=-1)*(L=1)*(A(18)>A(21))*(A(15)<A(21))PRINT"SELL":GOTO1000
870 IF(B=1)*(L=-1)*(A(18)<A(21))*(A(15)>A(21))PRINT"BUY":GOTO1000
880 IF(B=-1)*(L=-1)*(A(18)<A(21))*(A(15)>A(21))PRINT"DON'T BUY":GOTO1000
890 IF(B=1)*(A(18)>A(21))PRINT"BUY":GOTO1000
900 PRINT"INCONCLUSIVE"
1000 INPUT"PRESS ENTER TO CONTINUE";A$
1010 NEXTK
1020 END
2000 Y=0:IF(A(X)>A(X+1))*(A(X+1)>A(X+2))Y=1:RETURN
2010 IF(A(X)<A(X+1))*(A(X+1)<A(X+2))Y=-1
2020 RETURN
3000 IFY=1PRINT"UP":RETURN
3010 IFY=-1PRINT"DOWN":RETURN
3020 PRINT"NONE":RETURN
```

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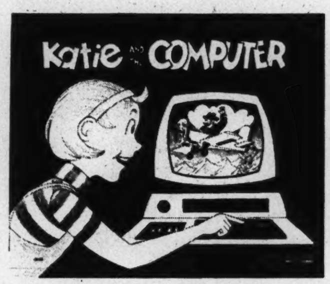

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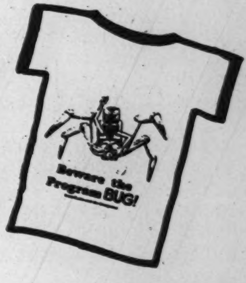
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Catching those incorrect inputs

The Challenge of Error Trapping

Mike K. Summers

John B. Willett

Introduction

In the School of Education at the University of Hong Kong we are designing and evaluating a variety of Computer-Assisted Learning (CAL) packages for use with low-cost microcomputers at school and university level. A typical CAL package consists of a computer program together with a student workbook and a teacher's guide. The teacher's guide should contain full program documentation together with a description of the educational aims of the package and suggestions for integrating the CAL work for the particular topic into the curriculum. Under the general guidance of the teacher, the student uses the microcomputer in an interactive mode to investigate problems posed in the student workbook. It is the interactive nature of the relationship between learner and machine that often creates problems for both the user and the CAL package designer. This is because the packages themselves must be user-proof. When the program requests the student to input information, inappropriate or incorrect responses (for example, typing errors) must be trapped. A trap is simply a program routine which checks the validity of the user's response to the computer's request for input. In the case of inappropriate or incorrect responses the trapping routine will inform the student of the nature of his error and suggest corrective action. In the absence of such a trap it is perfectly possible for an unwitting user to interrupt the program or even delete sections of it. This article is concerned with the general problem of trapping. Although the discussion below originates from work on computer-assisted learning, the information is of general interest since nearly all software designed for small computers involves some form of direct user-computer interaction (for example, gaming, simulation, computer art, small business applications and so on). The particular examples of trapping techniques described in this article refer to the Radio Shack TRS-80 microcomputer with Level II BASIC and 16K RAM, since this is the machine for which we are designing CAL materials. However, most of the practical experiences and suggestions are equally applicable to other inexpensive microcomputer systems with extended BASIC interpreters.

It is the interactive nature of the relationship between learner and machine that often creates problems for both the user and the CAL package designer.

The need for traps

When running a CAL program, the student is often required to input data. This data can be either NUMERICAL or ALPHABETIC. Depending on the nature of the data, a different type of input routine must be used. A typical routine asking for numerical input is listed below:

```
50 REM **** INPUT ROUTINE #1 ****
60 PRINT "WHICH STUDY DO YOU REQUIRE. TYPE 1 OR 2"
70 INPUT X
80 IF X = 1  THEN 100
90 IF X = 2  THEN 300
100 REM **** START OF STUDY ONE ****
,
,
,
,
,
,
300 REM **** START OF STUDY TWO ****
```

Obviously, this type of routine satisfies the essential requirements of a CAL package in which the student is offered a choice of two studies. In practice, however, such a simple routine cannot guard against the possibility of erroneous inputs. For example, if the student responds with any number other than 1 or 2, lines 80 and 90 will fail to detect the input and the program will automatically run to line 100 (the start of study one). If the student inputs alphabetic data, then the BASIC interpreter (which is expecting numerical input) returns its own error message. In the case of the TRS-80, the message REDO? appears on the screen. A further problem arises if the student inputs punctuation marks. With the TRS-80, a semicolon input produces a REDO? message, while commas and colons produce the error message EXTRA IGNORED (after which the program runs on to line 100). The trouble with messages of this kind is that they are either in poor English, or are abbreviations which may be totally incomprehensible to the package user. However, there is a more important reason for designing programs which prevent machine error messages of this kind appearing. The advent of cheap microcomputers with memory-mapped video displays and graphics facilities allows the designer of CAL packages to present information to the student page-by-page. Such a page mode of operation should be contrasted with the Teletype in which output is printed sequentially line by line. In the Teletype mode, the entire display scrolls up when the screen is full, so that information is eventually lost from the top of the screen. A microcomputer with graphics and memory-mapped video used in the paged mode allows very rapid presentation of information (a whole screen of information can be generated almost instantaneously) in a visually captivating form, and is ideal for CAL. An important focus of CAL program design is then to plan whole pages of attractive and interesting information with which the student is to interact. However, if an unforeseen machine error message such as REDO? is generated by the computer during program use, a carefully designed and attractive display can be destroyed. In the case of the TRS-80, REDO? may erase previously generated lines of display. More seriously, REDO?

A simple routine cannot guard against the possibility of erroneous inputs.

John Willett, Mike Summers, School of Education, University of Hong Kong, Hong Kong.

Error Trapping, cont'd...

causes the whole page to scroll upwards, so that planned information is premanently lost from the top of the screen. To avoid the problems, the CAL program designer must include trapping routines which not only check the validity of user inputs, but also print comprehensible corrective messages in good English at appropriate places on the screen. In other words, all input errors should be trapped by the CAL program itself so that the BASIC interpreter is never required to display its own error messages.

Alpha and Numeric INPUTS

Consider now an input routine designed for accepting alphabetic data. The routine below, for example, uses alphabetic data to 'turn the pages' of a video display:

```
 50 REM **** INPUT ROUTINE
      #2 ****
 60 PRINT "DO YOU WISH TO
      CONTINUE"
 70 INPUT R$
 80 IF R$ = "YES" THEN 100
 90 IF R$ = "NO" THEN 999
100 REM **** START OF NEXT
      PAGE ****
999 END
```

This routine is similar to the first one in that if the user responds correctly (in this case, with "YES" or "NO") the computer reacts appropriately. Also, if the user inputs any other alphabetic string (for example, "PERHAPS"), neither lines 80 nor 90 recognize R$ and the program automatically runs to line 100 where the page is turned. However, this input routine has one very important advantage over the routine designed to accept numerical input. If the user accidentally inputs numeric data, then the computer reacts in the same way as when an incorrect alphabetic string is input. This illustrates an important assymetry in the computer's handling of input data. In the case of the first input routine, an accidental alphabetical input when the computer is expecting numerical data results in an error message. In the second routine, an accidental numerical input when the computer is expecting alphabetic data produces no machine error message. This is simply a reflection of the fact that it is quite legitimate to store numbers in string form, but it is most definitely not legitimate to store alphabetic inputs as numbers. In both cases the user inputs are invalid, but the second routine does not upset the screen display with the unwanted REDO? error message. This fact is exploited in some of the trapping routines described later. The reaction of the second routine to punctuation mark inputs is similar but not identical to that of the first routine. This time commas, colons and semicolons all allow the program to run to line 100 where the page is turned without user permission. As before, the comma and the colon produce the error message EXTRA IGNORED, but this time the semicolon does not produce the disruptive REDO?.

The above discussion of problems which can arise from erroneous user inputs in interactive programs without traps, used two very simple input routines to provide examples. However, it should be noted that more sophisticated input routines can lead to even more catastrophic results. For example, the sophisticated programmer might decide to delete lines 80 and 90 from the first of the above input routines and replace them by the single line

```
85 ON X GOTO   100,300
```

However, if the user now responds to the input request with a negative number, the TRS-80 prints the error message ?FC ERROR IN 85, indicating an illegal function call (the ON expression GOTO line number, line number - statement is not valid for negative X) and the computer returns to the command mode. The program run is interrupted and the user confused. But potentially, there is a far greater problem than this. If, as a result of this confusion, the user now inputs a positive number, the corresponding line number will be deleted. Although situations of this kind are unlikely to arise, the CAL program designer must guard against all such eventualities to the best of his ability. This means he must devise as near-perfect trapping routines as possible.

The CAL program designer must include trapping routines which not only check the validity of user inputs, but also print comprehensible corrective messages in good English at appropriate places on the screen.

Types of trap

We will distinguish between two types of trap, and discuss them separately. The first is concerned with trapping invalid user responses to the computer's request for alphabetic input, while the second deals with invalid responses to requests for numerical input.

1. Alphabetic input

A modification of INPUT ROUTINE #2 which works reasonably well is given below:

```
 50 REM **** INPUT ROUTINE
      #3 ****
 60 PRINT "ARE YOU READY
      TO CONTINUE"
 70 INPUT R$
 80 IF R$ = "YES" THEN 110
 90 PRINT "INVALID RE-
      SPONSE. PLEASE RETYPE"
100 GOTO 70
110 REM **** START OF NEXT
      PAGE ****
```

It is most definitely not legitimate to store alphabetic inputs as numbers.

In lines 60 and 70 the computer requests alphabetic input. Line 80 tests for the positive response ("YES") which, if detected, results in a jump to the new page beginning at line 110. All other inputs, including both numbers and letters (or combinations), result in display of the corrective message INVALID RESPONSE. PLEASE RETYPE. Line 100 then causes a jump back to line 70 where the computer again waits for a valid user entry. In the case of the TRS-80, the only way the user can defeat this trap is by responding to the input request with a comma or a colon. The computer then returns the error message EXTRA IGNORED, but program execution proceeds correctly (the INVALID RESPONSE message is displayed). However, a spurious and undesired error message will have been generated and, in the paged mode, this may completely spoil a carefully designed display.

Marginal improvements of the above trap are possible using a combination of the TRS-80 statements PRINT @ **position, item list** and CHR$ (expression), together with judicious use of semicolons. We will first briefly review the function of these two statements and of the semicolon. The PRINT @ **position, item list** statement allows information to be printed starting at any one of 1024 separate locations on the memory-mapped screen. Existing lines can be overwritten, so that a message asking for user input can be replaced by a message indicating on invalid response, at exactly the same screen location. The CHR$ **expression** statement returns a one-character string whose character has the specified decimal ASCII code. For example, CHR$ (65) would return the letter A, since the decimal ASCII code for A is 65. The interesting thing about this statement is that it can also be used with the ASCII codes for control functions. Of particular use is CHR$ (30), where 30 is the ASCII code for the control function which erases to the

Error Trapping, cont'd...

end of the line (later). A semicolon at the end of a program line indicates to the computer that, when the line has been executed, the cursor should not move to the next line of output display, but should wait at the end of the current line of display. If, for example, the program line prints a request for user input on the screen, the cursor does not move to the next line to accept that input but waits at the end of the sentence requesting input. Let us now see how the above can be combined to produce a better trap:

```
 50 REM **** INPUT ROUTINE
    #4 ****
 60 PRINT @448, “ARE YOU
    READY TO CONTINUE”;
 70 INPUT R$
 80 IF R$ = “YES” THEN 110
 85 PRINT @448, CHR$ (30)
 90 PRINT @448, “INVALID
    RESPONSE. RETYPE”;
100 GOTO 70
REM **** START OF NEXT
    PAGE ****
```

As before, lines 60 and 70 request alphabetic input. However, this time both the question and user response occur one after the other on the same line (the line beginning at screen location 448) because of the semicolon at the end of line 60. Line 80 detects the positive response (“YES”) and causes a jump to the new page starting at line 110. If the user inputs an invalid response, the existing question and the response are erased by line 85 and replaced (beginning at the same screen location i.e. 448) by the INVALID RESPONSE message of line 90. The interesting thing about this trap is that it is almost foolproof. All inputs except commas and colons are trapped as with input routine #3. As before, comma and colon inputs result in the error message EXTRA IGNORED, but with input routine #4 this is immediately erased, and the trap continues to operate correctly (the INVALID RESPONSE message is displayed). We leave it to the more perverse reader to discover why this trap is only **almost** foolproof!

Another interesting trap for either alphabetic or numeric input is one in which the user response is searched (parsed) for particular alphanumeric characters or combinations of characters. Consider the following input routine:

```
 50 REM **** INPUT ROUTINE
    #5 ****
 60 PRINT “INPUT YOUR
    RESPONSE”
 70 INPUT R$
 80 FOR N = 1 to LEN (R$)
 90 K$ = MID$ (R$, N, 1)
100 IF K$ = “E” THEN 140
110 NEXT N
120 PRINT “INVALID RE-
    SPONSE. RETYPE”
130 GOTO 70
140 REM **** CONTINUATION
    OF PROGRAM ****
```

This routine searches the user input string to see if it contains the letter E in any position. Program execution is only allowed to continue if an E is detected. The core of the trap is contained in lines 80 through 110 which search the input string one letter at a time looking for the letter E. If this is detected, there is a jump from line 100 to line 140, where the program continues. Use is made of two statements found in many extended BASICs (LEN (string) and MID$ (string, x, y)). Len (string) returns the number of characters in the string in decimal form. MID$ (string, x, y) returns a substring extracted from the specified string. This substring is of length y and is extracted starting at position x (i.e., x characters from the start of the specified string). In the above routine, each character of the string R$ is extracted in turn and becomes the substring K$. This substring is compared to the letter “E” in line 100, and if equivalence is not detected, the INVALID RESPONSE message is displayed and the program returns to line 70 and awaits a new input. Such a trap is useful in some CAL programs, but more obviously in word, spelling and code-type games.

Several interesting modifications of input routine #5 are possible. One modification involves use of the TRS-80 statement ASC (string), which returns the decimal ASCII code of the first character of the specified string. This, for example, allows replacement of line 100 of input routine #5 by

```
100 IF ASC(K$) = 69 THEN 140
```

since the decimal ASCII code for the letter E is 69. In this particular instance there is no advantage in such a modification, but there are cases where use of ASC (string) can be of great value. One example might be a program in which the user response to the computer's request for input must consist only of alphabetic characters in a particular range (e.g., G through P). This can be achieved by rewriting line 100 as:

```
100 IF ASC (K$) > = 71 AND
    ASC (K$) < = 80 THEN 140
```

Since the decimal ASCII codes of the characters G and P are the numbers 71 and 80 respectively, the trap will only let through combinations of letters in the allowed range.

A final point to note about input routine #5 is that it suffers from the same pitfalls as input routine #3 described earlier. However, use of the modifications included in input routine #4 will render the various forms of input routine #5 virtually foolproof.

2. Numerical input

Earlier we noted an important assymetry in the reaction of the computer to different types of input. An accidental alphabetic input when the computer is expecting numerical input results in display of the machine error message REDO?, but accidental input of numeric data when alphabetic input is expected produces no such message. This assymetry can be usefully exploited when designing effective traps for numerical input. Consider the following:

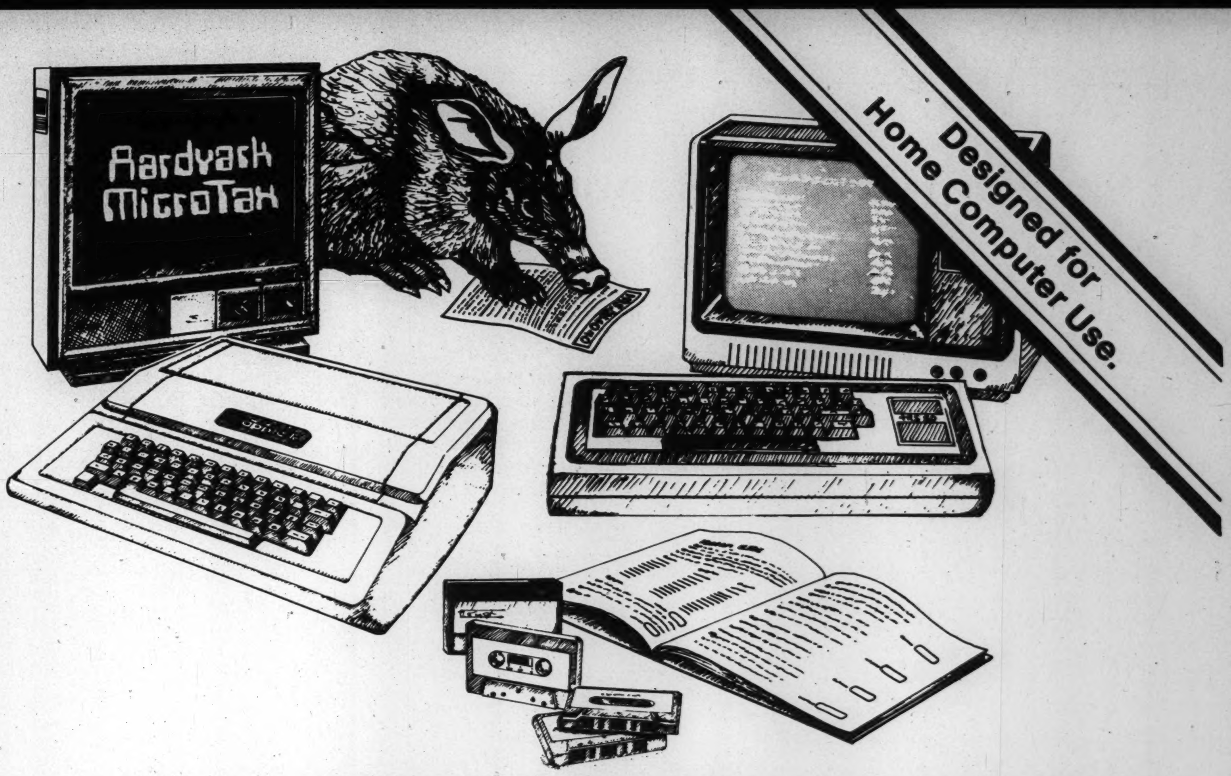
The search for the perfect trap goes on!

```
 50 REM **** INPUT ROUTINE
    #6 ****
 60 PRINT “WHICH STUDY DO
    YOU REQUIRE. TYPE 1 OR 2”
 70 INPUT R$
 80 R = VAL (R$)
 90 IF R = 1 THEN 130
100 IF R = 2 THEN 300
110 PRINT “INVALID RE-
    SPONSE. RETYPE”
120 GOTO 70
130 REM **** START OF
    STUDY 1 ****
    ,
    ,
    ,
300 REM *** START OF STUDY
    2 ****
```

In line 70 the computer is expecting a string input, and when a number is input it is stored as the string R$. It is, of course, quite legitimate to store numbers in string form and no machine error message is returned. Likewise, line 70 will accept accidental alphabetic inputs without display of a machine error message, but these will not be allowed through the trap. This is because line 80 extracts the numerical value of the input string using the VAL (string) statement, where VAL (string) automatically returns a numerical value of zero for string characters other than numbers. Lines 90 and 100 detect the allowed inputs 1 or 2, while other inputs result in display of the INVALID RESPONSE message of line 110. A combination of the above input routine with input routine #4 produces a trap for numerical input which is highly user-proof.

Final point

Although none of the traps described in this article are completely user-proof, some are very nearly so. By appropriate combination of the various techniques, the prospective program author should be able to design an effective trap suited to his needs. However, let there be no doubt, the search for the perfect trap goes on! ☐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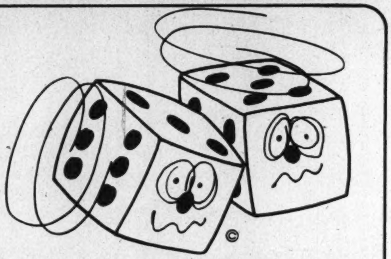
CIRCLE 101 ON READER SERVICE CARD

Stan and the Anti-Randomizer



N.B. Winkless, Jr.

Stan came zipping home from Little League and found his father sitting at the keyboard, cussing.

"S'matter, Pop?"

"Grmmphh," his pop said. "I'm trying to demonstrate a system at dice, and your randomizer works like a broken record. Look at my picture." He called for RUN and got this:

```
POP'S RUN -- PART ONE
RUN? 87.43
 10  8  9  12  3  10  7  6  8  7  2  12  4  7  8  9
 2  9  4  10  10  8  11  8  8  8  5  8  8  9  6  10
 10  6  10  4  6  11  8  4  4  6  5  5  4  5  6  7
11  7  7  8  8  7  8  5  11  5  8  6  8  8  3  12  7
  9  8  12  9  6  8  5  7  12  12  12  7  11  6  8
8  9  7  2  5  5  10  9  7  6  3  7  7  9  8  7  7
8 . 5 . 7
```

Six 8's in eight rolls. Does that look **random**?"

"It can happen, can't it?"

"Grmmphh." the run continued.

```
POP'S RUN -- PART TWO
 2  *** 3
 3  *** 3
 4  ****** 6
 5  ********** 10
 6  ********** 10
 7  ***************** 17
 8  ********************** 22
 9  ********* 9
 10 ******** 8
 11 ***** 5
 12 ******* 7
RUN CCDED # 87.43
READY
```

"Nice chart, Pop. Let's see the program."

```
10 !PROGRAM BY STAN'S POP
20 DIM H(12)
30 POKE(16R0512)=52:!SETS PRINTER LINE,'IDTH
40 INPUT "RUN";Z:Y=RND(Z):!THE SEED
50 PRINT: PRINT
60 C1=INT(6*RND(0))+1
70 C2=INT(6*RND(0))+1: C=C1+C2
80 H(C)=H(C)+1
90 T=T+1
100 PRINT C;
110 IF T/100=INT(T/100) THEN 130
120 GOTO 60
130 PRINT:PRINT:FOR X=2 TO 12:PRINT X;TAB(5);REPEAT$
("*",H(X));H(X): NEXT X
140 PRINT "RUN CODED #";Z
150 END
READY
```

Stan wrinkled his freckles. "Well, that's the way this random number generator pumps 'em out, Pop. Are you sure you really want **random** runs -- or would you like a straight chunk of what's probable?"

"Wot?"

"You want to show what happens when some particular betting system meets the dice, right? You don't want a bias toward winning, or toward losing, but just a straight extension of the probabilities. You got your program saved? Then lemme sit in. I've got a thought. You go read the paper. . ."

Grmmph. Pop went off.

He was into the financial section when Stan called him back. "How's this grab you?"

```
STAN'S RUN -- PART ONE
RUN? 87.43
 9  8  3  7  9  4  2  10  7  9  7  5  8  11  3  6  1
0  8  6  6  7  7  12  8  8  5  6  5  6  7  4  11  9
 10  5  4  8  4  11  9  3  2  6  11  10  7  7  8  6
 8  10  9  5  8  5  10  3  5  7  7  8  12  6  5  6
4  7  4  9  6  7  9  5  7  10  4  9  6  9  5  6  4
9  10  9  8  7  7  12  8  8  5  3  3  11  6  5  2  7
  11  6  8  7  7  4  10  8  6  6  10  7  7  10  4  6
  5  5  6  7  12  6  9  4  10  8  7  4  7  6  8  2
9  9  8  8  9  11  5  7  3  3  8  5  11
```

"Hmm."

"I hooked up with your charting. Watch. . ."

```
STAN'S RUN -- PART TWO

 2  **** 4
 3  ******** 8
 4  ************ 12
 5  **************** 16
 6  ******************** 20
 7  ************************ 24
 8  ******************** 20
 9  **************** 16
 10 ************ 12
 11 ******** 8
 12 **** 4
RUN CODED # 87.43
READY
```

"Hmm. What did you do, Stan?"

Stan explained. "I set you up to get all 36 of the possible dice outcomes each time you run through 36 rolls." he listed the program.

```
10 !PROGRAM BY STANISLAUS
20 DIM H(12),X(36):X1=36: X6=36: GOSUB 200
30 POKE(16R0512)=52:!PRINTER LINEWIDTH
40 INPUT "RUN";Z:Y=RND(Z):!THE SEED
50 PRINT: PRINT
60 GOSUB 270
80 H(C)=H(C)+1
90 T=T+1
100 PRINT C;
110 IF T/144=INT(T/144) THEN 130
120 GOTO 60
130 PRINT:FOR X=2 TO 12:PRINT X;TAB(5);REPEAT$("*",H
(X));H(X):NEXT X
140 PRINT "RUN CODED #";Z
150 END
200 FOR X4=1 TO 36
210 READ X2
230 X(X4)=X2
240 NEXT X4
250 RESTORE
260 RETURN
270 X4=INT(X6*RND(0))+1
280 C=X(X4):X(X4)=X(X6)
290 X6=X6-1
300 IF X6<1 THEN X6=36: GOSUB 200
310 RETURN
320 DATA 7,6,7,8,5,6,7,8,9,4,5,6,7,8,9,10,3,4,5,6,7,
8,9,10,11,2,3,4,5,6,7,8,9,10,11,12
READY
```

N. B. Winkless, Jr., 11745 Landale St., North Hollywood, CA 91607.

Anti-Randomizer, cont'd...

"At 110 through 170, I load up 36 "boxes" with one each of the 36 outcomes. You get 6 sevens, 5 sixes, 4 fives, and so on, every time through, each in proportion to its probability. At 180 I generate a random value; at 190 I use that value to pick a box with a number that hasn't yet been withdrawn. You know, the same routine as dealing cards from a deck without replacement. Then when they're all gone, at 210 I reload the boxes and start again. You get a random **look**, but with certainty of a correct distribution."

Pop studied the listing. "Unh-hunh. Two problems. Your "chunk of what's probable" won't look right. In life, we don't hit all the numbers in exact proportion every 36 rolls. And probablility doesn't say that we will. You've given me a 36-roll chunk of the average at **infinity**. It's fair, in its way, but it won't **look** right."

Stan pondered. "What's the other problem?"

"I'd like to produce **decisions** -- not just **rolls**. There are some one-roll decisions: 2,3,7,11, and 12. But when a number is hit (e.g., 4,5,6,8,9 or 10) another roll is called for. Hit it again, and it wins; hit a 7, and it loses. The 4 and the 10 have one chance in three of winning; the 5 and the 9 have two chances in five; the 6 and the 8 have five chances in eleven. But I can't trust that feeble built-in randomizer to play fair."

Stan scratched his nose, and finally nodded. "Go away, Pop. Lemme build something. I'll take care of both those problems."

* * *

"Every-36 is too short a cycle," Stan told himself. "I'll increase the size of the batch -- say to five groups of 36. And as for producing decisions on the numbers in accurate distribution, I can pre-determine those as well..."

Two hours later, they called Stan to supper. "Be right down!" he said. But at midnight, Pop found him asleep at the keyboard. On the CRT, this message --

DON'T TOUCH ANYTHING

Pop turned off the disk drive and carried the Little Leaguer to his bed. The machine purred softly all night.

* * *

Next day, when Pop came home, Stan was bright-eyed and ready. "Stand by for a run, Pop!" It ran-

STAN'S SECOND EFFORT — THE RUN

```
THE ANTI-RANDOMIZER — BY STANISLAUS K. PURINTON 4/4/79
RUN? 87.43

4W 9W 3L 6L 6L 8L 8L 3L 12L 5L 8W 12L 6W 9L 8W 7W 8W 8L 8L 7W 6W 4L 6L 8W 10W 7W 4
L 11W 4W 11W 5W 6W 4L 7W 6L 6W 5L 6W 5W 5L 10L 7W 8L 3L 5L 5W 7W 9W 2L 3L 8W 12L 4
L 11W 10L 10W 11W 2L 7W 4W 11W 3L 5L 12L 2L 11W 10L 9L 7W 7W 7W 6L 7W 8L 10L 5W 3L
 5L 7W 10W 7W 6L 8L 6L 7W 12L 7W 6L 7W 8L 7W 4L 8W 10L 7W 2L 4L 11W 9L 9W 9L 9W 5L
 7W 5W 7W 6W 9L 10L 8W 6W 7W 10W 8W 8L 11W 4W 7W 6L 3L 6W 3L 7W 9L 10L 2L 7W 9W 6L
 6W 6W 8L 9L 5L 9W 8W 4L 3L 5W 7W 6L 5L 5L 9L 11W 6L 9L 7W 8L 4L 9W 5W 8W 9L 3L 7W
 10L 8L 5L 4W 8L 9W 9L 4L 7W 9L 7W 10W 5W 8L 6L 4L 10L 7W 11W 5L 6L 8W 10L 6W
IN THESE  180 DECISIONS,
WE'VE SEEN  88 WINS, 92 LOSERS
LOSING EDGE:   2.2222222 %

 2    ***** 5
 3    ********** 10
 4    *************** 15   ACTUAL WINS, 5 ;PROBABLE WINS, 5.00
 5    ******************** 20   ACTUAL WINS, 8 ;PROBABLE WINS, 8.00
 6    ************************* 25   ACTUAL WINS, 11 ;PROBABLE WINS,11.36
 7    ****************************** 30
 8    ************************* 25   ACTUAL WINS, 11 ;PROBABLE WINS,11.36
 9    ******************** 20   ACTUAL WINS, 8 ;PROBABLE WINS, 8.00
 10   *************** 15   ACTUAL WINS, 5 ;PROBABLE WINS, 5.00
 11   ********** 10
 12   ***** 5
RUN # 87.43
READY
```

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Acorn produces several other utility programs for the TRS-80. These include *"Aterm"* and *"Numbering"* by Tom Stibolt; and *"Disassembler"*, *"Tape Utility"* and *"Disk Utility"* by Roy Soltoff. All are available for less than $20.00. Ask for these and other quality Acorn programs at your local computer store.

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CIRCLE 104 ON READER SERVICE CARD

Anti-Randomizer, cont'd...

"WOW!" Pop said. "Tell me about it."
"Let me show you the program."

```
10 PRINT "THE ANTI-RANDOMIZER — BY STANISLAUS K. PURINTON 4/4/79"
20 DIM Z(180): G=180:!PROVIDES BATCH OF 5 GROUPS OF 36 OUTCOMES
30 GOSUB 500:!THIS ROUTINE "FILLS THE BOXES"
40 DIM H(12), C(12),R(12): M=1
50 POKE(16R0512)=82:!SETS THE PRINTER LINEWIDTH
60 ! FOLLOWING LINE SETS CHARACTER-SIZE (SPACING)
70 V$=CHAR$(27)+CHAR$(31)+CHAR$(10): OPEN 0"*P":PUTOV$;:CLOSE0
80 !PRINT CHAR$(16):! TURNS ON THE PRINTER
90 INPUT "RUN";Z1:Z2=Z1:Z1=RND(-Z1):!THE SEED, TO ENABLE REPEAT
100 GOSUB 530:!GOES TO FIND A VALUE, 1 TO 36
110 GOSUB 200:!GOES TO ANALYZE IT AS WINNER/LOSER & WHY
120 T=T+1:! COUNTS THE DECISIONS
130 PRINT D$;" ";:! PRINTS A DECISION BY THE NUMBERS, + A SPACE
150 IF T/180=INT(T/180) THEN GOSUB 400:!DISPLAYS THE SCORE
160 GOTO 100:!RETURNS TO FIND ANOTHER VALUE
200 !2,3,7,11, AND 12 BECOME INSTANT DECISIONS
205 !4,5,6,8,9, AND 10 ARE NUMBERS: SOME WIN, SOME LOSE
210 IF C=2 THEN D$="2L" :V=V+1:RETURN
215 IF C=3 THEN D$="3L":V=V+1:RETURN
220 IF C=4 THEN C(4)=C(4)+1:GOSUB 304:RETURN:! COUNTS HITS ON 4
225 IF C=5 THEN C(5)=C(5)+1:GOTO 312:! COUNTS HITS ON 5...
230 IF C=6 THEN C(6)=C(6)+1; GOTO 320:! ETC.
235 IF C=7 THEN W=W+1: D$="7W": RETURN
240 IF C=8 THEN C(8)=C(8)+1:GOTO 328
245 IF C=9 THEN C(9)=C(9)+1:GOTO 336
250 IF C=10 THEN C(10)=C(10)+1:GOSUB 342:RETURN
255 IF C=11 THEN W=W+1:D$="11W": RETURN
260 IF C=12 THEN D$="12L":V=V+1:J1=J1+1: RETURN
300! THESE SELECT LOSERS IN PROPORTION TO THEIR PROBABILITY
302 !TWO OUT OF THREE FOURS ARE LOSERS
304 IF C(4)>1 THEN D$="4L":V=V+1:GOSUB 350:RETURN
306 R(4)=R(4)+1: ! COUNTING WINNING FOURS
308 D$="4W":W=W+1: RETURN
310 !THREE OUT OF FIVE FIVES ARE LOSERS
312 IF C(5)=1 OR C(5)=3 OR C(5)=5 THEN D$="5L": V=V+1:GOSUB 356:RETURN
314 R(5)=R(5)+1:!COUNTING WINNING FIVES
316 D$="5W":W=W+1: RETURN
318 !SIX OUT OF ELEVEN SIXES ARE LOSERS
320 IF C(6)=1 OR C(6)=2 OR C(6)=5 OR C(6)=7 OR C(6)=10 OR C(6)=11 THEN D$="6L":V=V
+1:GOSUB 360:RETURN
322 R(6)=R(6)+1:! COUNTING WINNING SIXES
324 D$="6W":W=W+1: RETURN
326 !SIX OUT OF ELEVEN EIGHTS ARE LOSERS
328 IF C(8)=1 OR C(8)=2 OR C(8)=6 OR C(8)=7 OR C(8)=9 OR C(8)=11 THEN D$="8L":V=V+
1:GOSUB 364:RETURN
330 R(8)=R(8)+1:! ETC.
332 D$="8W":W=W+1: RETURN
334 ! ETC.
336 IF C(9)=2 OR C(9)=4 OR C(9)=5 THEN D$="9L": V=V+1:GOSUB 368:RETURN
338 R(9)=R(9)+1
340 D$="9W":W=W+1:RETURN
342 IF C(10)>1 THEN D$="10L":V=V+1:GOSUB 372:RETURN
344 R(10)=R(10)+1
346 D$="10W":W=W+1: RETURN
348 !WHEN WE'VE COUNTED THREE HITS ON 4, WE RESET THE COUNTER
350 IF C(4)=3 THEN C(4)=0
352 RETURN
354 !WHEN WE'VE COUNTED FIVE HITS ON 5, ETC.
356  IF C(5)=5 THEN C(5)=0
358 RETURN
360 IF C(6)=11 THEN C(6)=0
362 RETURN
364 IF C(8)=11 THEN C(8)=0
366 RETURN
368 IF C(9)=5 THEN C(9)=0
370 RETURN
372 IF C(10)=3 THEN C(10)=0
374 RETURN
400 PRINT
410 PRINT "IN THESE ";T;"DECISIONS,"
415 PRINT "WE'VE SEEN ";W;"WINS,";V;"LOSERS"
420 D=V-W:H=D/T*100:!DIFFERENCE,LOSERS MINUS WINNERS...
425 !DIVIDE DIFFERENCE BY TOTAL DECISIONS, * 100 FOR %
430 PRINT "LOSING EDGE:  ";H;"%"
435 !SHOW HITS AS A CHART:THIS VERSION OF BASIC USES 'REPEAT$'
440 !WITHOUT THAT CAPABILITY, YOU CAN FIND ANOTHER WAY
445 PRINT:FOR X=2 TO 12
450 PRINT X;
455 PRINT TAB(7); REPEAT$("*",H(X));H(X);:IF X=2 OR X=3 OR X=7 OR X=11 OR X=12 THE
N PRINT:! WE HAVE TO BREAK LOOSE FROM THE SEMI
460 IF X=4 OR X=10 THEN PRINT "  ACTUAL WINS,";R(X);";PROBABLE WINS,";FMT(((H(X)/3
)*100),"ZZ.99"):!ZZ.99 TRUNCATES THE FRACTION
465 IF X=5 OR X=9 THEN PRINT "  ACTUAL WINS,";R(X);";PROBABLE WINS,";FMT(((H(X)/5*
2)*100),"ZZ.99")
470 IF X=6 OR X=8 THEN PRINT "  ACTUAL WINS,";R(X);";PROBABLE WINS,";FMT(((H(X)/11
*5)*100),"ZZ.99")
475 NEXT X
480 IF T=180 THEN 495
485 PRINT CHAR$(15);
490 PRINT: RETURN
495 PRINT "RUN #"; Z2: END
500 FOR Q=1 TO 180
505 READ X
510 Z(Q)=X
515 NEXT Q
520 RESTORE
525 RETURN
530 G1=RND(0)
535 IF G1<0 THEN G1=G1*-1: PRINT "HAD TO DO IT"
540 E=INT(G*G1)+1
545 C=Z(E):Z(E)=Z(G)
550 C=MOD(C,36)
555 H(C)=H(C)+1
560 G=G-1
565 IF G=0 THEN G=180:GOSUB 500
570 RETURN
575 DATA 2,3,3,4,4,4,5,5,5,5,6,6,6,6,6,7,7,7,7,7,7,8,8,8,8,8,9,9,9,9,10,10,10,11,1
1,12
580 DATA 12,11,11,10,10,10,9,9,9,9,8,8,8,8,8,7,7,7,7,7,7,6,6,6,6,6,5,5,5,5,4,4,4,3
,3,2
585 DATA 2,3,4,5,6,7,8,9,10,11,12,3,4,5,6,7,8,9,10,11,4,5,6,7,8,9,10,5,6,7,8,9,6,7
,8,7
590 DATA 12,11,10,9,8,7,6,5,4,3,2,11,10,9,8,7,6,5,4,3,10,9,8,7,6,5,4,9,8,7,6,5,8,7
,6,7
595 DATA 2,3,4,5,6,7,8,9,10,11,12,3,4,5,6,7,8,9,10,11,4,5,6,7,8,9,10,5,6,7,8,9,6,7
,8,7
READY
```

"Lines 10 through 90 are just the necessary set-up," Stan said. "I've put in a lot of notes to explain. I've made a batch of five groups of 36 outcomes, proportionate to their probabilities -- the DATA down at the end. At 30, I go to 500 to load up.

"Now, at 100, I go for the first outcome. The randomizer at 530 chooses a box, as before -- but now it's one of 180 boxes, so there's no cycling until we've used them all.

"At 110, I go to analyze the number we draw from the box -- and of course your one-roll decisions answer themselves. But see what I do with the numbers. If it's a 4, at 220 I start counting (C(4) = C(4) + 1). . . and then go to 304. If this is the first 4 we've hit, I slide through the IF and score up a win. If it's the second or third 4, it's a loser, and I go to 350 to check whether this is a third 4 of a series, and I reset the counter to zero if it is.

Same routine on other numbers. The first, third, and fifth 5's are losers. Six of every eleven 6's are losers. And so on."

"Wow," said Pop.

"Notice the summary, Pop. In 180 decisions, we hit 2 to 12 in the exact proportion of their probabilities. But of course we can't square up that way on wins-and-losses on the numbers. You see that 6 and 8 are short of their probable wins. You can see why."

Pop said, "Er. . ."

"Because you can't divide 180 by eleven and come out even. Our factors are 3,5,11,36. Our least common denominator is 1980."

"Of course," said Pop.

"What are we looking for in the way of advantage, losers over winners?"

"It's 1.414%."

"That's what happens at 1980 decisions. It's 976 winners, 1004 losers. Wanna see it?"

"I believe it, son," said Pop. "One problem: you're still using the randomizer that comes with the Basic."

Stan stared. "Pop, I didn't know you like egg in your beer." □

> "Too many people live too much in the past. The past must be a springboard, not a sofa."
>
> **Harold Macmillan**
>
> "Nowadays almost exclusive stress is laid on learning what has happened and has been done. Tomorrow . . . at least one third of all lectures and exercises ought to be concerned with scientific, technical, artistic and philosophical work in progress, anticipated crises and possible future answers to these challenges."
>
> **Robert Jungle**

Come Help Us Celebrate The Child

During the current International Year of the Child St. Jude Children's Research Hospital continues its desperate search for life saving knowledge about catastrophic childhood disease.

As the only research center devoted entirely to the conquest of the illnesses that destroy the lives of too many children the world over, St. Jude Hospital celebrates the child with every new finding. And there have been so many.

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Research offers the only firm hope.

Research at St. Jude Children's Research Hospital continues because people care. There is no charge to patients or their families once admitted to its research studies by physician referral. The ever increasing cost of drugs, equipment, and research programs has been met primarily by public contributions.

This miraculous celebration of the child knows no race, creed, or financial distinction.

Come, help us celebrate the child. Please send your tax deductible check or your request for further information to St. Jude Children's Research Hospital,
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ST. JUDE CHILDREN'S
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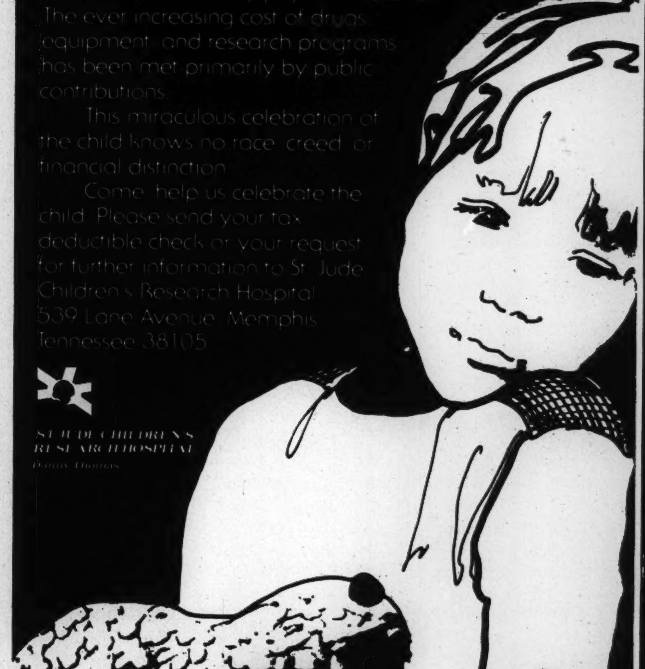
Danny Thomas



SIMUTEK PRESENTS

★ TRS-80 ★

GAMES

!!! WHOLESALE !!!

★ ★ ★ PACKAGE ONE ★ ★ ★

GRAPHIC-TREK "2000" — This full graphics, real time game is full of fast, exciting action! Exploding photon torpedoes and phasers fill the screen! You must actually navigate the enterprise to dock with the giant space stations as well as to avoid klingon torpedoes! Has shields, galactic memory readout, damage reports, long range sensors, etc! Has 3 levels for beginning, average, or expert players! ★ **INVASION WORG** — Time: 3099, Place: Earth's Solar System Mission: As general of Earth's forces, your job is to stop the Worg invasion and destroy their outposts on Mars, Venus, Saturn, Neptune, etc! Earth's Forces: Androids — Space Fighters — Lazer Cannon — Neutrino Blasters! Worg Forces: Robots — Saucers — Disintegrators — Proton Destroyers! Multi level game lets you advance to a more complicated game as you get better! ★ **STAR WARS** — Manuever your space fighter deep into the nucleus of the Death Star! Drop your bomb, then escape via the only exit. This graphics game is really fun! May the Force be with you! ★ **SPACE TARGET** — Shoot at enemy Ships with your missiles. If they eject in a parachute, capture them — or if you're cruel, destroy them! Full graphics, real time game! ★ **SAUCERS** — This fast action graphics game has a time limit! Can you be the commander to win the distinguished cross! Requires split second timing to win! Watch out!

★ ★ ★ PACKAGE TWO ★ ★ ★

CHECKERS 2.1 — Finally! A checkers program that will challenge everyone! Expert as well as amateur! Uses 3-ply tree search to find best possible move. Picks randomly between equal moves to assure you of never having identical games. ★ **POKER FACE** — The computer uses psychology as well as logic to try and beat you at poker. Cards are displayed using TRS-80's full graphics. Computer raises, calls, and sometimes even folds! Great practice for your Saturday night poker match! (Plays 5 card draw). ★ **PSYCHIC** — Tell the computer a little about yourself and he'll predict things about you, you won't believe! A real mind bender! Great amusement for parties. ★ **TANGLE MANIA** — Try and force your opponent into an immobile position. But watch out, they're doing the same to you! This graphics game is for 2 people and has been used to end stupid arguments. (And occasionally starts them!) ★ **WORD SCRAMBLE** — This game is for two or more people. One person inputs a word to the computer while the others look away. The computer scrambles the word, then keeps track of wrong guesses.

★ ★ ★ PACKAGE THREE ★ ★ ★

POETRY — This program lets you choose the subject as well as the mood of the poem you want. You give TRS-80 certain nouns or names, then the mood, and it does the rest! It has a 1000-word + vocabulary of nouns, verbs, adjectives and adverbs! ★ **ELECTRIC ARTIST** — Manual: draw, erase, move as well as, Auto: draw, erase and move. Uses graphics bits not bytes. Saves drawing on tape or disk! ★ **GALACTIC BATTLE** — The Swineus enemy have long range phasers but cannot travel at warp speed! You can, but only have short range phasers! Can you blitzkrieg the enemy without getting destroyed! Full graphics — real time! ★ **WORD MANIA** — Can you guess the computer's words using your human intuitive and logical abilities? You'll need to, to beat the computer! ★ **AIR COMMAND** — Battle the Kamikaze pilots. Requires split second timing. This is a FAST action arcade game.

★ ★ ★ PACKAGE FOUR ★ ★ ★

LIFE — This Z-80 machine language program uses full graphics! Over 100 generations per minute make it truly animated! You make your starting pattern, the computer does the rest! Program can be stopped and changes made! Watch it grow! ★ **SPACE LANDER** — This full graphics simulator lets you pick what planet, asteroid or moon you wish to land on! Has 3 skill levels that make it fun for everyone. ★ **GREED II** — Multi-level game is fun and challenging! Beat the computer at this dice game using your knowledge of odds and luck! Computer keeps track of his winnings and yours. Quick fast action. This game is not easy! ★ **THE PHARAOH** — Rule the ancient city of Alexandria! Buy or sell land. Keep your people from revolting! Stop the rampaging rats. Requires a true political personality to become good! ★ **ROBOT HUNTER** — A group of renegade robots have escaped and are spotted in an old ghost town on Mars! Your job as "Robot Hunter" is to destroy the pirate machines before they kill any more settlers! Exciting! Challenging! Full graphics!

★ ★ ★ PACKAGE FIVE ★ ★ ★

SUPER HORSERACE — Make your bets just like at the real racetrack! 8 horses race in this spectacular graphic display! Up to 9 people can play! Uses real odds but has that element of chance you see in real life! Keeps track of everyone's winnings and losses. This is one of the few computer simulations that can actually get a room of people cheering! ★ **MAZE MOUSE** — The mouse with a mind! The computer generates random mazes of whatever size you specify, then searches for a way out! The second time, he'll always go fastest route! A true display of artificial intelligence! Full graphics, mazes & mouses! ★ **AMOEBA KILLER** — You command a one man submarine that has been shrunken to the size of bacteria in this exciting graphic adventure! Injected into the president's bloodstream, your mission is to destroy the deadly amoeba infection ravaging his body! ★ **LOGIC** — This popular game is based on Mastermind but utilizes tactics that make it more exciting and challenging → has 2 levels of play to make it fun for everyone. ★ **SUBMARINER** — Shoot torpedoes at the enemy ships to get points. Fast action graphics, arcade type game is exciting and fun for everybody!

★ ★ ★ PACKAGE SIX ★ ★ ★

20 HOME FINANCIAL PROGRAMS — Figures amortization, annuities, depreciation rates, interest tables, earned interest on savings and much, much more. These programs will get used again and again. A must for the conscientious, inflation minded person.

★ ★ ★ PACKAGE SEVEN ★ ★ ★

BACKGAMMON 5.0 — 2 different skill levels make this game a challenge to average or advanced players. (Not recommended for beginners). Looks for best possible move to beat you! FANTASTIC GRAPHICS. Plays doubles and uses international rules. ★ **SPEED READING** — Increases your reading speed. Also checks for comprehension of material. Great for teenagers and adults to improve reading skills. ★ **PT 109** — Drop depth charges on moving subs. Lower depths get higher points in this fast action graphics game. ★ **YAHTZEE** — Play Yahtzee with the computer. This popular game is even more fun and challenging against a TRS-80! ★ **WALL STREET** — Can you turn your $50,000 into a million dollars? That's the object of this great game. Simulates an actual stock market!

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CIRCLE 185 ON READER SERVICE CARD

A public health simulation

Dogbite

Randall Lockwood, Ph.D.

"Dog Bites Man" is not news, largely because it is very common. At least 2% of the U.S. population is bitten by dogs each year, seriously enough to require medical attention. The victims are usually children between the ages of 5 and 9. As large dogs are becoming more popular, the injuries are becoming more serious.

Among adults, certain occupations are associated with a disproportionate number of bites. Letter carriers and meter readers are bitten about 15 times as often as other adults. Unfortunately, society has tended to take these problems lightly. You can even buy mailman-shaped biscuits for your dog! However, public health officials and victims are starting to recognize the "epidemic" proportions of the problem.

DOG BITE grew out of a belief that simulations based on real-world situations can be both entertaining and useful. (See "Jury Selection" and "Real World Games", **Creative Computing,** volume 4, number 5). DOG BITE is based on a series of studies conducted with the cooperation of the St. Louis branch of the U.S. Postal Service. In these studies, Dr. Alan Beck and I reviewed all accident reports for dog bites to letter carriers in St. Louis during 1971-1972. These were compared to reports of non-dog related accidents. In addition, I spent a year working the routes with letter carriers, noting the incidence of dogs, the interactions that occurred, the areas of greatest risk and the effectiveness of different responses to dangerous situations. I have tried to include both my statistical findings and my intuitive knowledge of dog-human encounters in DOG BITE to create a fun and challenging simulation.

Background

There appear to be four main factors that affect the dog-bite history of a letter carrier. The first is the nature of the assignment. Carriers who visit the same houses each day have a chance to learn where the dogs are, particularly the nasty ones. At the same time, the dogs have a chance to get used to a regular intruder. However, mail is delivered 6 days a week and most carriers work only 5. On these odd days a new person shows up, and is thus a more likely target. Other carriers routinely fill in for those who are absent or ill, and thus have the same problems.

Another important variable is the nature of the area being served. Urban areas, particularly apartment buildings, are safe as far as dog bite is concerned. The dogs are usually small and inside and many deliveries can be made at one time. Suburban areas with one and two family homes present greater dangers. Dogs are likely to be running loose or to get loose during a delivery. Stray dogs (i.e., those with no owners) are not much of a problem in DOG BITE or in real life. The greatest problems are caused by straying pets, or animals that get out when a customer opens the door to receive mail.

Once a letter carrier faces a confrontation with a dog, the third factor becomes important: the ability to "read" the animal's intentions and react accordingly. Even friendly animals should not be encouraged to approach (and this is **not** an option in DOG BITE), since their reaction to the uniform and apparatus of the letter carrier may be unpredictable. We found several carriers who were bitten by their own dogs after they put on their uniforms.

The letter carrier has the options of attempting delivery, withholding delivery, running away, confronting the animal or using a chemical repellent. Most carriers avoid using a spray since they want to avoid possible injury to dogs, and unpleasant reactions from dog-owners. You will face the same kinds of problems in using chemical sprays in DOG BITE.

The letter carriers' success in avoiding a bite is also related to a fourth factor . . . LUCK. Even careless people may get away unharmed and even the most cautious may be bitten.

DOG BITE provides a good opportunity to familiarize yourself with the many factors that interact in a public health simulation. Hopefully, playing DOG BITE may even help you avoid becoming a statistic in our next program!

About The Program

DOG BITE is written, appropriately, in "PET" Basic. However, the version presented here does not make use of any of the special PET graphics or cursor control commands, so it is easily adapted to all Basic dialects. The only peculiarities are line 15, which takes the place of a "RANDOMIZE" instruction, and the use of the GET command instead of INPUT or INKEY$. I suggest that you add the "CLEAR/HOME" instruction for your system before lines 10, 100, 455, 540 and 1505. This will make things a bit neater. PET owners should have the warning messages print in reverse video to add to the drama.

In writing a public health simulation, one is often in the situation of having numerator data without denominators. For example, we know how many biting dogs are poodles, but we have to rely on other sources to try to estimate the proportion of poodles that bite. To keep DOG BITE true-to-life, while realizing that we cannot perfectly predict dangerous situations, I have made some compromises. I have aimed for an average of 3 dangerous encounters per game. This is high, but a more realistic game would be dull. The *relative* rates of the various events (dog loose, dog is barking, etc.) are

---

Randall Lockwood, Ph.D., Dept. of Psychology, State University of New York, Stony Brook, NY 11794.

A New Type of Game

Welcome to an astonishing new experience! **ADVENTURE** is one of the most challenging and innovative games available for your personal computer. This is not the average computer game in which you shoot at, chase, or get chased by something, master the game within an hour, and then lose interest. In fact, it may take you more than an hour to score at all, and will probably take days or weeks of playing to get a good score. (There is a provision for saving a game in progress).

This game was inspired by the huge Adventure game which has appeared on large mainframe computers the last several years. But there are important differences. Not only will **ADVENTURE** fit into a relatively small computer, but the 'interpreter' is designed so that different Adventures can be created by changing the data base. So look for more Adventures in the future...

In playing the game you wander thru various 'rooms' (locations), manipulating the objects there to try to find 'treasures'. You may have to defeat an exotic wild animal to get one treasure, or figure out how to get another treasure out of a quicksand bog. You communicate thru two-word commands such as 'go west', 'climb tree', 'throw axe', 'look around'.

Adventure

For Apple, TRS-80, Sorcerer, PET, CP/M

MISSION IMPOSSIBLE ADVENTURE (by Scott Adams) - Good Morning, Your mission is to... and so it starts. Will you be able to complete your mission in time? Or is the world's first automated nuclear reactor doomed? This one's well named, its hard, there is no magic but plenty of **suspense**. Good luck.....

THE COUNT (by Scott Adams) - You wake up in a large brass bed in a castle somewhere in Transylvania. Who are you, what are you doing here, and WHY did the postman deliver a bottle of blood? You'll love this Adventure, in fact, you might say it's LOVE AT FIRST BITE.....

ADVENTURELAND (by Scott Adams) - You wander through an enchanted world trying to recover the 13 lost treasures. You'll encounter WILD ANIMALS, MAGICAL BEINGS, and many other perils and puzzles. Can you rescue the BLUE OX from the quicksand? Or find your way out of the maze of pits? Happy Adventuring.....

VOODOO CASTLE (by Scott Adams) - Count Cristo has had a fiendish curse put on him by his enemies. There he lies, with you his only hope. Will you be able to rescue him or is he forever doomed? Beware the Voodoo Man.....

ORIGINAL ADVENTURE (by Crowther, Woods, Manning and Roichel) - Somewhere nearby is a collosal cave where others have found fortunes in treasures and gold, but some who have entered have never been seen again. You start at a small brick building which is the wellhouse for a large spring. You must try to find your way into the underground caverns where you'll meet a giant clam, nasty little dwarves, and much more. **This Adventure is Bi-Lingual**—you may play in either **English or French**—a language-learning tool beyond comparison. Runs in 32K CP/M system (48K required for SAVE GAME feature). Even includes SAM76 language in which to run the game. The troll says "Good Luck."

PIRATE ADVENTURE (by Scott Adams) - "Yo Ho Ho and a bottle of rum..." You'll meet up with the pirate and his daffy bird along with many strange sights as you attempt to go from your London flat to Treasure Island. Can you recover LONG JOHN SILVER's lost treasures? Happy sailing matey.....

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Dogbite, cont'd . . .

consistent with the actual data.

The general design of DOG BITE is to assign certain basic risk factors and then increase or decrease the risks according to the situations that arise and the choices made by the player. If the risk factors reach a critical level and the situation is right — a bite will occur. More specifically:

lines 235-540:
: assign basic risk (BR) and adjust the risk factor, RF according to the assignment

lines 545-820:
: select the type of delivery and evaluate the risks associated with that type of delivery according to the carrier's assignment

lines 830-995:
: set up a confrontation and adjust RF according to the dog's temperament (determined at 4000-4300) and player's choices.

line 1000:
: determines if RF is great enough for a bite

lines 1010-1210:
: determine the nature of bite injury

lines 1500-1550:
: report on performance in the simulation. □

References

Beck, A.M., Loring, H. and Lockwood, R. 1975. The ecology of dog bite injury in St. Louis, Mo., *Public Health Reports*, 90(3):262-267.

Lockwood, R. and Beck, A.M. 1975. Dog bites among letter carriers in St. Louis, *Public Health Reports*, 90(3):267-269.

A cassette with a PET BASIC version of DOG BITE, along with copies of the original research reports and documentation are available from the author at cost for $2.00.

```
1 REM R.LOCKWOOD/DEPT.OF PSYCH./SUNY,STONY BROOK,11794
5 PRINTSPC(14);       "DOG BITE
15 ZZ=RND(-TI):REM RANDOMIZE
20 PRINT:PRINT"THIS SIMULATION IS BASED ON ACTUAL
25 PRINT"DOG ATTACK DATA COLLECTED BY R .LOCKWOOD
30 PRINT"AND A. BECK IN ST. LOUIS,MO.
40 PRINT:PRINT" THE LIKELIHOOD OF AN ENCOUNTER
45 PRINT"WITH A DOG HAS BEEN MADE HIGHER
50 PRINT"IN THIS SIMULATION TO MAKE THINGS
55 PRINT"MORE INTERESTING.
60 PRINT:PRINT"  THE OUTCOME OF AN ENCOUNTER WILL
65 PRINT"DEPEND ON YOUR DECISIONS AS WELL AS
70 PRINT"ON ENVIRONMENTAL AND CHANCE FACTORS.
80 PRINT:PRINT" ARE YOU READY TO BEGIN?
82 GET A$:IF A$="" THEN 82
90 IFA$<>"Y"THEN82
95 GOTO110
100 PRINT:PRINT:PRINT"   YOU ARE A LETTER CARRIER IN THE
110 PRINT:PRINT:PRINT"   YOU ARE A LETTER CARRIER IN THE
120 PRINT"CITY OF GNAWSHVILLE,WHICH HAS A DOG
125 PRINT"BITE PROBLEM.
130 PRINT:PRINT"   YOU ARE TO ATTEMPT TO MAKE 10
135 PRINT"DELIVERIES ON YOUR ROUTE. IF YOU DO
140 PRINT"THIS WITHOUT BEING BITTEN OR ALIEN-
145 PRINT"ATING YOUR CUSTOMERS,YOU WIN!":PRINT:PRINT
148 RA=0:H=0:N=0:W=0:ND=0:B=0
150 PRINT"CHECKING MY RECORDS, I SEE THAT YOU
155 PRINT"HAVE BEEN BITTEN ";PB;" TIME";
160 IF PB=1THEN PRINT" BEFORE.":GOTO180
165 PRINT"S BEFORE.
170 IF PB=0 THEN 190
180 PRINT"YOU'D BETTER BE MORE CAREFUL!!":GOTO200
190 PRINT"YOU'RE EITHER NEW TO THIS GAME OR
195 PRINT"SIMPLY LUCKY...WATCH OUT!
200 PRINT:PRINT:PRINT"DO YOU WANT TO (1) CHOOSE AN
205 PRINT"ASSIGNMENT OR (2) HAVE ME ASSIGN
210 PRINT"YOU? (I'LL TRY TO BE FAIR).TYPE
215 PRINT"THE APPROPRIATE NUMBER.
220 GETC$:IFC$=""THEN220
221 C=VAL(C$):IFC>2THEN220
222 IFC=0THEN220
230 IF C=1 THEN 280
234 PRINT:PRINT:PRINT
235 PRINT:PRINT"O.K. I'LL GIVE YOU AN ASSIGNMENT
240 GOSUB 2000
245 PRINT"FIRST I'LL ASSIGN A SCHEDULE
246 PRINT
250 IF R<=70 THEN S=1:GOTO 310
255 IF R<=85 THEN S=2:GOTO 310
260 S=3:GOTO 310
280 PRINT:PRINT" FIRST PICK AN ASSIGNMENT:":PRINT
285 PRINT"      (1) REGULAR CARRIER
290 PRINT"      (2) UTILITY CARRIER
300 PRINT"      (3) SUBSTITUTE CARRIER
305 PRINT"YOUR CHOICE ? (ENTER NUMBER):
306 GETM$:IFM$=""THEN306
307 S=VAL(M$):IFS=0THEN306
308 IFS>3THEN306
310 IFS=1THENS$="REGULAR CARRIER
315 IFS=2THENS$="UTILITY CARRIER
320 IFS=3THENS$="SUBSTITUIE CARRIER
321 PRINT:PRINT" YOU ARE A "S$
330 GOSUB 2000
340 BR=INT(25*RND(1)+1)
360 IFS=1THENBR=BR+10
370 IFS=2THENBR=BR+30
380 IFS=3THENBR=BR+30
400 PRINT:PRINT"HERE IS SOMETHING YOU SHOULD KNOW:
405 ON S GOTO 410,420,440
410 PRINTS$;"S ARE KNOWN TO LOCAL"
415 PRINT"DOGS AND THUS GET FEWER BITES.":GOTO455
420 PRINTS$;"S COVER VARIOUS ROUTES
425 PRINT"EACH DAY AND DON'T GET TO KNOW THE
430 PRINT"LOCAL DOGS.
435 GOTO455
440 PRINTS$;"S FILL IN FOR
445 PRINT"REGULARS AND ARE STRANGERS
450 PRINT"TO LOCAL DOGS.
455 PRINT:PRINT"HIT ANY KEY TO CONTINUE
460 GETK$:IFK$=""THEN460
480 PRINT:PRINT:PRINT"    GNAWSHVILLE HAS FOUR NEIGHBORHOODS:":PRINT
482 PRINT"  (1)PUNY ARMS-LUXURY APTS.":PRINT
484 PRINT"  (2)SUPERCILIOUS MANOR-UPPER
485 PRINT"      INCOME SINGLE FAMILY HOUSES":PRINT
487 PRINT"  (3)TACKYTOWN-MID INCOME 1 AND 2
488 PRINT"      FAMILY HOUSES
490 PRINT:PRINT"  (4)RATHAVEN-LOW INCOME 2 FAMILY"
491 PRINT"      HOUSES":PRINI
500 IFC=1THEN522
502 PRINT"I'LL ASSIGN YOU A NEIGHBORHOOD"
505 GOSUB 2000
510 IFR>=90 THEN A=1:GOTO525
515 IF R>=70 THEN A=2:GOTO 525
520 IF R>=30 THEN A=3:GOTO 525
521 A=4:GOTO 525
522 PRINT"PICK A NEIGHBORHOOD (1-4):
523 GETG$:IFG$=""THEN523
524 A=VAL(G$):IFA=0THEN523
525 IFA>4THEN523
526 IFA=1THENT$="PUNY ARMS"
527 IFA=2THENT$="SUPERCILIOUS MANOR"
528 IFA=3THENT$="TACKY TOWN"
529 IFA=4THENT$="RAT HAVEN"
530 PRINT:PRINT"YOU'LL BE GOING TO ";T$
535 PRINT:PRINT"HIT ANY KEY TO BEGIN
536 GETX$:IFX$=""THEN536
540 RA=0:RF=BR:OP=0:RA=0:N=N+1:IF N=11 THEN 1500
544 IFN>1THENGOSUB3000
545 PRINT:PRINT:PRINTSPC(8);"DELIVERY # ";N;:PRINT:PRINT:GOSUB2000
550 IF R<=60 THEN D$="REGULAR MAIL":D=1:GOTO 570
555 IF R<=80 THEN D$="A PACKAGE":D=2:GOTO570
560 IF R<=90 THEN D$="A SPECIAL DELIVERY":D=2:GOTO 570
565 D$="A POSTAGE DUE LETTER":D=2:GOTO 570
570 PRINT"YOUR DELIVERY IS ";D$
575 IF D=1 THEN 580
577 PRINT"THE CUSTOMER WILL HAVE TO OFEN"
578 PRINT"THE DOOR TO GET IT.":PRINT:PRINT
579 FOR X=1 TO 500:NEXT X
580 GOSUB 2000
585 IF A=1 AND R>=60 THEN 640
590 IF A=2 AND R>=40 THEN 640
600 IF A=3 AND R>=40 THEN 640
610 IF A=4 AND R>=65 THEN 640
615 PRINT"THERE DON'T SEEM TO BE ANY DOGS":PRINT
620 GOSUB2000
630 IF R>8 THEN 1025
635 PRINT"WAIT!...HERE COMES A STRAY!":GOTO850
640 PRINT"** DOG ALERT **"
650 GOSUB 2000
660 IF A=1 AND R>=65 THEN 720
670 IF A=2 AND R>=50 THEN 720
680 IF A=3 AND R>=60 THEN 720
690 IF A=4 AND R>=40 THEN 720
700 IF R<=10 THEN PRINT "THE DOG IS SECURELY CONFINED":GOTO 1025
710 PRINT"THE DOG IS INSIDE":F=0:GOTO 750
720 F=1:RF=RF+50:PRINT:PRINT"**THE DOG IS LOOSE**"
750 PRINT:PRINT"WHAT DO YOU WANT TO DO?
760 PRINT:PRINT"      (1) HTTEMPT DELIVERY"
770 PRINT"      (2) WITHHOLD DELIVERY":PRINT
772 GETQ$:IFQ$=""THEN772
773 Q=VAL(Q$)
774 IFQ<1ORQ>2THEN772
776 IF Q=1 THEN 800
780 PRINT"O.K., DELIVERY WITHHELD.
781 PRINT:PRINT"WE'LL GO ON TO THE NEXT HOUSE...":PRINT
782 W=W+1:GOTO 540
```

```
800 IF F=1 THEN 850
810 GOSUB 2000
815 IF R<=60 AND D=2 THEN 830
820 GOTO1025
830 PRINT:PRINT"** THE OWNER LET THE DOG OUT **":PRINT:
                                             RF=RF+60
850 GOSUB 4000
870 PRINT"** IT'S COMING TOWARDS YOU"
875 PRINT"WHAT DO YOU WANT TO DO?
880 PRINT:PRINT"    (1)RUN AWAY
885 PRINT"    (2)USE CHEMICAL SPRAY
890 PRINT"    (3)STAND STILL
900 PRINT"    (4)WALK AWAY":PRINT
902 GETZ$:IFZ$=""THEN902
903 Z=VAL(Z$):IFZ=0THEN902:IFZ>4THEN902
910 ON Z GOTO930,935,970,990
930 RF=RF+20:ND=ND+1:RA=1:GOTO1000
935 IF RND(1)>.4THEN950
940 PRINT"YOU CAN'T GET IT OUT !!!..."
945 RF=RF+5:GOTO 1000
950 PRINT"PSSSSSSTTTTTTTT.......":PRINT
952 IF DF<=10THENPRINT"YOU SPRAYED A HARMLESS DOG!!"
955 IFDF>25THENPRINT"THAT WAS CLOSE !"
960 RF=RF-30:GOSUB2000:IFR<50ANDOP=0THEN1000
965 PRINT"THE CUSTOMER SAW THAT!!!":H=H+1
967 IFCP<>0THENPRINT"YOU SHOULDN'T USE HALT AROUND KIDS!"
968 GOTO1000
970 IFRF<=100THENPRINT"GOOD JUDGEMENT!"
975 RF=RF-20:GOTO1000
990 IF RF<=1000THENPRINT"GOOD CHOICE.":PRINT
995 RF=RF-20:ND=ND+1:RA=1
1000 IF RF>100 THEN 1060
1010 PRINTSPC(6);"**** BITE AVOIDED ****":PRINT
1020 IF RA=1 THEN 1040
1025 PRINT"DELIVERY COMPLETED";
1035 GOTO 540
1040 PRINT"BUT YOU FAILED TO MAKE THE DELIVERY."
1050 GOTO540
1060 PRINT:PRINT"!!!! A BITE !!!!":ND=ND+1
1065 GOSUB 2000:B=1:PB=PB+1
1067 PRINT:PRINT"HE GOT YOUR ";
1070 IFR>90THEN1135
1080 IFRND(1)<.5THENPRINT" RIGHT ";:GOTO1115
1090 PRINT" LEFT ";
1115 IF R<=35 THEN PRINT"LEG.":GOTO 1200
1120 IF R<=70 THEN PRINT"FOOT.":GOTO 1200
1125 IF R<=80 THEN PRINT"ARM.":GOTO 1200
1130 IF R<=90 THEN PRINT"HAND.":GOTO 1200
1135 PRINT "BODY.": GOTO 1200
1200 PRINT"YOU WILL NEED TREATMENT."
1205 PRINT"YOU'RE OUT OF THE GAME!"
1210 N=N+1:GOTO1500
1490 FORZZ=1 TO 1000:NEXT
1500 PRINT:PRINT:PRINT
1505 PRINT"*********** SUMMARY ***********":PRINT:PRINT
1510 PRINT"YOU COMPLETED ";N-W-ND-1;" DELIVERIES."
1515 IF B=0 THEN 1525
1520 PRINT"AND WERE BITTEN.":GOTO 1530
1525 PRINT"AND WERE NOT BITTEN.":PRINT
1530 PRINT"YOU ALIENATED ";H+W+ND;"CUSTOMER(S)"
1550 PRINT"BY USING HALT OR FAILING TO DELIVER.":PRINT:PRINT
1560 PRINT"DO YOU WANT TO TRY AGAIN?
1570 GET Q$:IF Q$="" THEN 1570
1580 IFQ$="N"THEN9999
1590 GOTO 148
1995 GOTO9999
2000 R=INT(100*RND(1)+1):RETURN
3000 FORDD=1TO5000:NEXT:RETURN
4000 REM DOG FACTORS
4005 DF=0
4010 IFR<=40THENT$="GERMAN SHEPHERD":DF=DF+10:GOTO4070
4020 IFR<=55THENT$="MUTT":DF=DF+5:GOTO4070
4030 IFR<=65THENT$="POODLE":DF=DF+10:GOTO4070
4040 IFR<=85THENT$="BIG DOG":DF=DF+10:GOTO4070
4050 IFR<=95THENT$="LITTLE DOG":GOTO4070
4060 T$="DOBERMAN"
4070 PRINT"IT'S A ";T$;"."
4075 REM BARK
4080 GOSUB2000
4085 IFR<=30THENPRINT"IT'S NOT BARKING":DF=DF-10:GOTO4100
4090 IFR<=80THENPRINT"IT'S BARKING AT YOU!":
     DF=DF+INT(RND(1)*6):GOTO4100
4095 PRINT"IT'S BARKING AND GROWLING!":DF=DF+10
4100 REM TAIL
4105 GOSUB2000
4110 IFR<33THEN PRINT"IT'S TAIL IS DOWN.":DF=DF-10:GOTO4200
4120 IFR<=66THENPRINT"IT'S TAIL IS UP AND WAGGING SLOWLY.":
     DF=DF+5:GOTO4200
4130 PRINT"IT'S TAIL IS UP AND WAGGING FAST!":DF=DF+5
4200 REM OWNER PRESENT
4205 GOSUB2000:OP=0
4210 IFR<=60THEN4300
4220 IFR<=75THENPRINT"THE OWNER IS OUTSIDE.":OP=1:DF=DF+10:
     GOTO4300
4230 PRINT"THERE IS A CHILD NEARBY.":DF=DF+10:OP=1:CP=1
4300 RETURN
9999 PRINT"O.K., THANK'S FOR PLAYING DOGBITE!":END
```

```
            SAMPLE RUN

RUN

   THIS SIMULATION IS BASED ON ACTUAL
DOG ATTACK DATA COLLECTED BY R. LOCKWOOD
AND A. BECK IN ST. LOUIS, MO.

 THE LIKELIHOOD OF AN ENCOUNTER WITH
A DOG HAS BEEN MADE HIGHER IN THIS
SIMULATION TO MAKE THINGS MORE
EXCITING.

  THE OUTCOME OF AN ENCOUNTER
WILL DEPEND ON YOUR DECISIONS AS WELL
AS ON ENVIRONMENTAL FACTORS AND CHANCE.

HIT ANY KEY TO BEGIN

Y
  YOU ARE A LETTER CARRIER IN THE
CITY OF GNAWSHVILLE, WHICH HAS A DOG
BITE PROBLEM.

   YOU ARE TO ATTEMPT TO MAKE 10
DELIVERIES ON YOUR ROUTE.  IF YOU
DO THIS WITHOUT BEING BITTEN OR ALIEN -
ATING YOUR CUSTOMERS... YOU WIN!

CHECKING MY RECORDS I SEE THAT
YOU HAVE BEEN BITTEN  0 TIMES
BEFORE.
YOU'RE EITHER NEW TO THIS GAME OR
SIMPLY LUCKY...WATCH OUT!!

DO YOU WANT TO (1) CHOOSE AN
ASSIGNMENT OR (2) HAVE ME ASSIGN YOU?
(I'LL TRY TO BE FAIR)
TYPE THE APPROPRIATE NUMBER
2

O.K., I'LL GIVE YOU AN ASSIGNMENT
FIRST I'LL ASSIGN YOU A SCHEDULE

YOU ARE A SUBSTITUTE CARRIER

HERE IS SOMETHING YOU SHOULD KNOW:

SUBSTITUTE CARRIERS FILL IN FOR REGULARS
AND ARE CONSIDERED TO BE STRANGERS
BY THE LOCAL DOGS.
HIT ANY KEY TO CONTINUE

Y

GNAWSHVILLE HAS FOUR NEIGHBORHOODS

  (1)PUNY ARMS-LUXURY APTS.

  (2)SUPERCILIOUS MANOR-UPPER INCOME
     SINGLE FAMILY HOUSES

  (3)TACKYTOWN-MID INCOME 1 AND
     2 FAMILY HOUSES

  (4)RATHAVEN-2 FAMILYHOUSES

I'LL ASSIGN YOU A NEIGHBORHOOD.

YOU'LL BE GOING TO TACKYTOWN

HIT ANY KEY TO BEGIN

           DELIVERY # 1

YOUR DELIVERY IS REGULAR MAIL
THERE DON'T SEEM TO BE ANY DOGS
DELIVERY COMPLETED

           DELIVERY # 2

YOUR DELIVERY IS A PACKAGE
THE CUSTOMER WILL HAVE TO OPEN
THE DOOR TO GET IT.

***** DOG ALERT *****

THE DOG IS INSIDE.

WHAT DO YOU WANT TO DO?

   (1) ATTEMPT DELIVERY
   (2) WITHHOLD DELIVERY
2
O.K. ,DELIVERY WITHHELD.
WE'LL GO ON TO THE NEXT HOUSE.

           DELIVERY # 3

YOUR DELIVERY IS REGULAR MAIL

***** DOG ALERT *****

THE DOG IS SECURELY CONFINED.
DELIVERY COMPLETED

           DELIVERY # 4

YOUR DELIVERY IS A POSTAGE DUE LETTER
THE CUSTOMER WILL HAVE TO OPEN
THE DOOR TO GET IT

***** DOG ALERT *****

THE DOG IS INSIDE.

WHAT DO YOU WANT TO DO?

   (1) ATTEMPT DELIVERY
   (2) WITHHOLD DELIVERY
1

!!!! THE OWNER LET THE DOG OUT !!!!

****  IT'S COMING TOWARDS YOU ****

IT'S A GERMAN SHEPHERD

IT'S BARKING
IT'S TAIL IS UP AND WAGGING SLOWLY
THE OWNER IS PRESENT.

WHAT DO YOU WANT TO DO?

   (1) RUN AWAY
   (2) USE CHEMICAL SPRAY
   (3) STAND STILL
   (4) WALK AWAY SLOWLY

1

##### A BITE #####

THE DOG GOT YOUR RIGHT HAND
YOU WILL NEED TREATMENT
YOUR'RE OUT OF THE GAME

--------------- SUMMARY ---------------

YOU COMPLETED 2 DELIVERIES
AND WERE BITTEN!
YOU ALIENATED 2 CUSTOMER(S)
BY USING THE SPRAY OR FAILING TO DELIVER

DO YOU WANT TO TRY AGAIN?

N
 THANKS FOR PLAYING DOGBITE!!!!!
```

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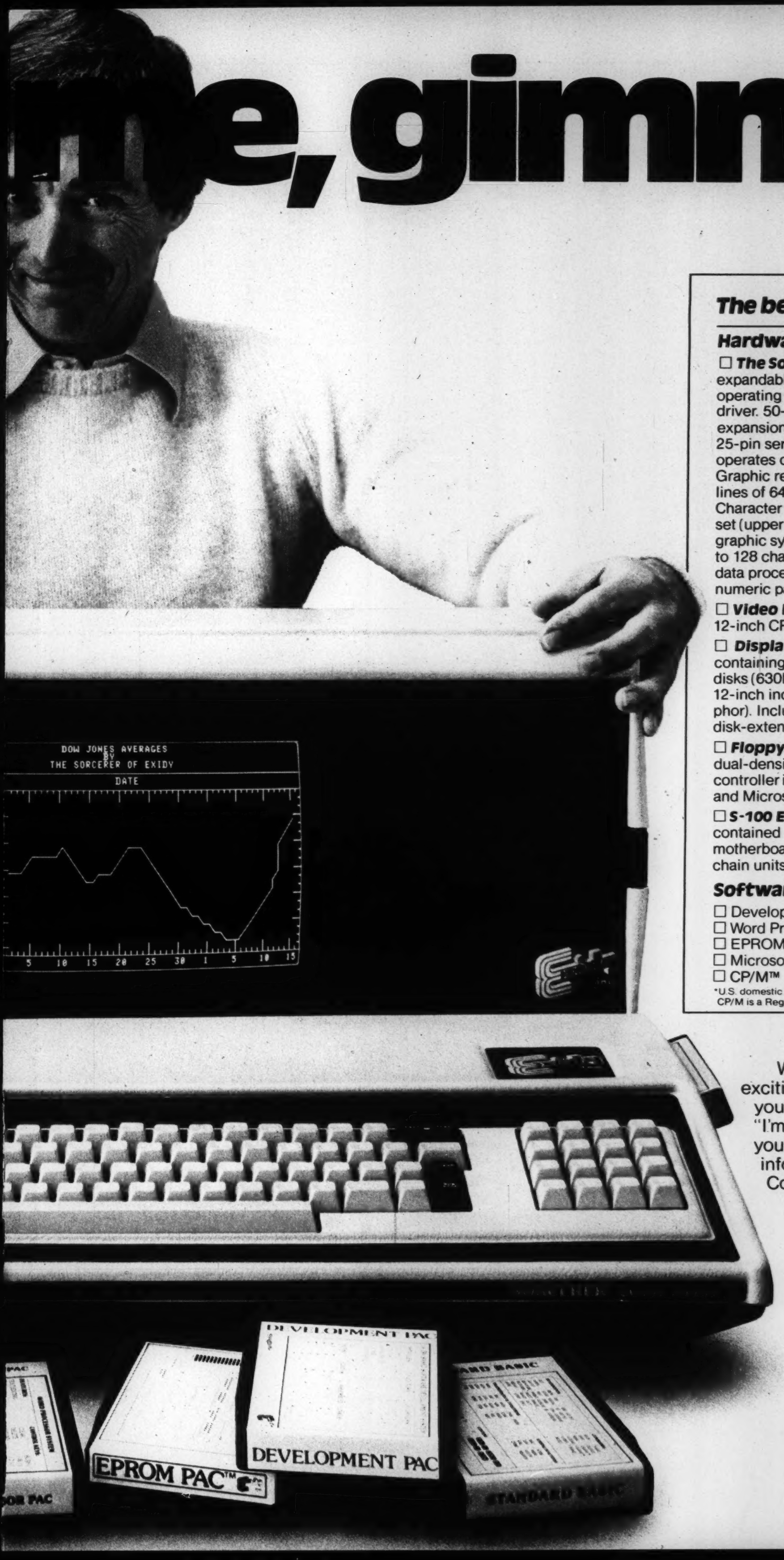
AVERAGE
950
940
930
920
910
900
DATE
SORCERER
WORD
USER'S MANUAL
Z80 Based Sof
Development System
WORD PROCESSOR

e,gimme."



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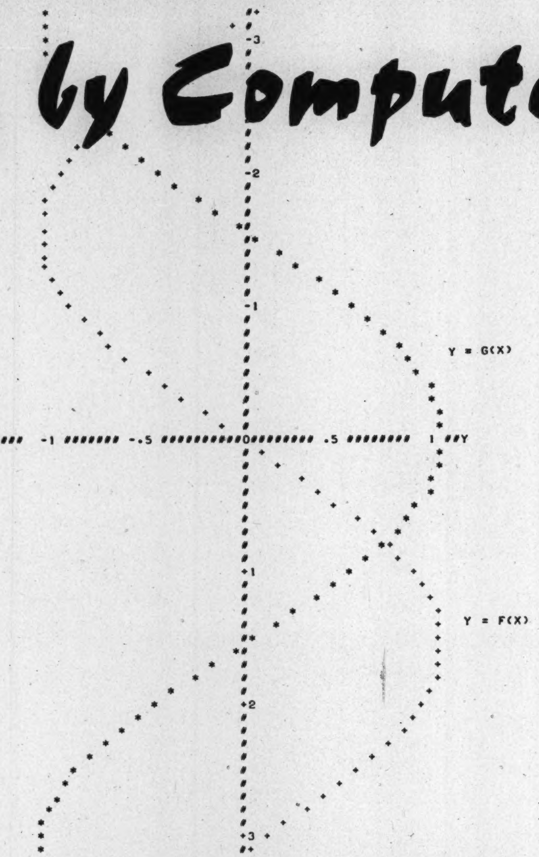
CIRCLE 140 ON READER SERVICE CARD

Graphing by Computer



Graphs provide a useful means for investigating the properties of functions. Roots and maximum and minimum points can be estimated, regions in which the function is increasing or decreasing can be readily determined, and so on. Since calculating enough points to make a meaningful graph can be tedious and time-consuming, it is logical to consider applying the speed and accuracy of a computer to the problem. The purpose of this module is to illustrate the advantages and limitations of using a computer in such applications.

After reviewing the graphing process using a second degree polynomial as an example, we will formulate a graphing algorithm. We will then write a computer program which uses this algorithm. Finally, we will suggest other graphing problems which will require that you write more sophisticated graphing programs.

Graphing a Second Degree Polynomial

In order to graph a function f(x) we must obtain a list of ordered pairs of numbers of the form (a, f(a)); these correspond to points in the plane where a is the abcissa and f(a) is the ordinate. Recall that the set of possible values for a is called the domain and the set of possible values for f(a) is called the range.

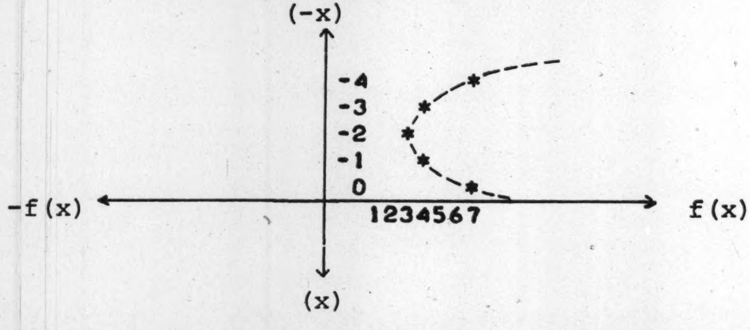
Let's look at the function $f(x) = x^2 + 4x + 7$ on the domain $[-4 \leq x \leq 0]$. We must now find ordered pairs of numbers by substituting values of the domain into the function and finding the corresponding values of the range. We will do this only for the integers in the interval.

x	f(x)
−4	7
−3	4
−2	3
−1	4
0	7

Now we plot* these points on a rectangular coordinate graph as follows:

This is a reprint of one of the original Project Solo curriculum modules developed at the University of Pittsburgh. Project Solo was supported in part by the National Science Foundation, and it was directed by Tom Dwyer and Margot Critchfield. The modules were authored by various persons, including project staff, teachers, and students.

It should be kept in mind that Project Solo began in 1969 (which is probably before some of Creative's readers were born.) Undoubtedly, many of the modules would be done differently today. There are also surely errors to be found, and neither Creative Computing, the authors, or NSF can warrant the accuracy of the reprints. But as a starting point for your own explorations, they should make a good (albeit slightly ancient) set of shoulders to stand upon. We hope you enjoy the view.



Graphing, cont'd . . .

If we draw a smooth curve through the points we see that the graph of f(x) $= x^2 + 4x + 7$ is a parabola. Note that the domain $[-4 \le x \le 0]$ was well chosen since it contains the vertex (minimum point). What can you say about the roots of the equation $f(x) = x^2 + 4x + 7$?

Formulation of the Algorithm

At this point we will analyze what we have done in making a graph by hand into a number of steps without referring to a specific function such as $f(x) = x^2 + 4x + 7$.

The result will be an algorithm which can be applied in general.

Step 1. Choose a domain of interest. This will be an interval of the form $[a \le x \le b]$.
Step 2. Choose a step size d.
Step 3. Assign the value of a to the variable x.
Step 4. Calculate f(x).
Step 5. Place a mark at the point (x, f(x)) on the graph.
Step 6. Increase x by the step size d.
Step 7. If $x \le b$ go to step 4; otherwise stop.

Note that steps 4 through 7 are repeated; hence f(x) is computed and the corresponding points plotted for $x = a, a + d, \ldots$ until $x > b$.

The Program

Below is a computer program written in Basic which uses the algorithm we developed to produce the graph above. Try the program by copying the statements exactly as shown. Try to relate the statements of the program to the steps of the algorithm.

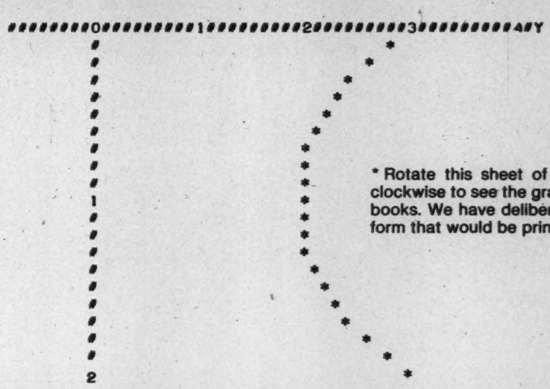
```
10 LET A=-4
15 LET B=0
20 LET I=1
30 LET X=A
40 LET F=X↑2+4*X+7
50 PRINT TAB(10): X: TAB(F+11): "*"
60 LET X=X+I
70 IF X<=B GOTO 40
75 PRINT "            1234567"
80 END
```

"TAB(10)" in statement 50 causes X to be printed in the eleventh space; similarly, TAB(F+11) causes the "*" to be printed in the (F+12)th space (not the (10+F+12)th). In statement 75 be sure to leave 12 blanks before the 1. (Can you think of a better way to do this?)

Exploration

The following exercises require that you write programs which produce better graphs than the sample program can handle.

1.



* Rotate this sheet of paper 90° counterclockwise to see the graph as shown in textbooks. We have deliberately shown it in the form that would be printed on a computer.

Above is the graph of a parabola produced by a Basic program. Revise the program in the previous section so that it produces a comparable graph (in terms of number of points plotted, size, etc.) of the function $f(x) = x^2 + 4x + 7$ for $-4 \le x \le 0$.

2. Write a program to graph the function $f(x) = 0.1\,x^2 - 0.2x$ for $-1 \le x \le 3$. **Hint:** Multiply the function by a "Scale Factor" and relabel the y-axis. How would you handle the problem of negative values of f(x)? Notice that the roots of the polynomial equation are values of x where the graph crosses the x-axis. This means that $f(x) = 0$ at these points, which are therefore sometimes called "Zeroes" of the function.

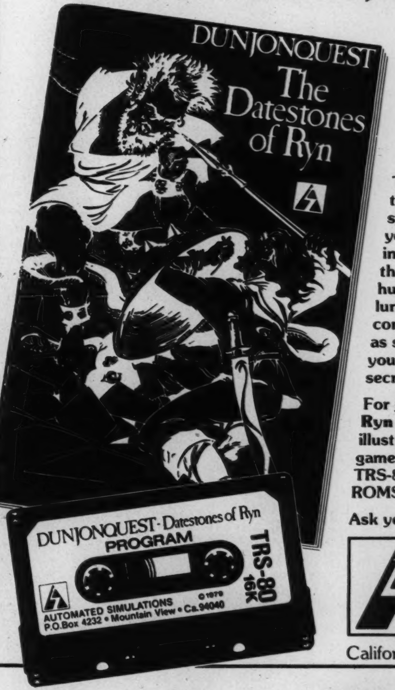
3. Write a program to use in estimating the minimum value of the function $f(x) = (x^2 + 1)/x$, $0.2 \le x \le 4.0$. (Why wasn't x=0 included in the domain of f?)

4. Write a program to solve the pair of equations:

$y = 0.9_x$
$y = \frac{1}{3} x^2 - \frac{1}{2}x$

Hint: Write a program which graphs both functions at once; the solutions are the values of x where the graphs intersect. □

Try a Really Different Kind of Software for Your TRS-80, PET, or APPLE!



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CIRCLE 113 ON READER SERVICE CARD

Another new game from Creative Computing ....

DUKEDOM

Richard Kaapke

DUKEDOM is a much extended version of the popular Hammurabi land management game. The game is fun to play, but it is also an outstanding educational tool for learning to manage limited resources. There are also hazards such as rats, locusts, plagues, taxes, and wars with which to contend.

The version of DUKEDOM presented here runs in a 48K CP/M system with Microsoft Disk BASIC. About 13K of BASIC workspace is used. Thus, with the appropriate conversions, this game will probably run in a 16K Level II TRS-80. It can also be converted to run in Applesoft but will probably take more than 16K because of the more extensive conversions involved.

For Level II TRS-80s: the only known necessary conversions are for LINE INPUT and DEF FN. For the former, use regular INPUT, which works fine although it's not as tidy. To convert DEF FN, expand out the functions in line with the program. For example, line 1050 would become:

```
Q3% = RND(1) * (1 + Q2% - Q1%) + Q1%
```

and line 6500 would become:

```
X1 = (RND(1) * (1 + F3% - (-F3%)) + (-F3%)
   + R(8)) + 4
```

[think about it!]

For users of other computers, we suggest you buy a Level II manual at your local Radio Shack store to find out how Microsoft Extended BASIC works. Disk capabilities are not required except for printing the instruction file, reproduced here verbatim. Enjoy! —SN

```
 TYPE B:DUKEDOM.INS

You are one of several Dukes chosen by the High King to help run the
Kingdom.  Your Duchy is not in the best of shape, and your job is to
build up its population, land holdings and grain reserves.  Your secret
ambition is to become powerful enough to overthrow the High King.

The game cycles on an annual basis, and it is now fall and the harvest
has just been completed.  Each year at this time the computer will
display the current population, land and grain totals, followed by a
detailed report of the previous year's events.  Note that land and
grain are measured in metric units hectares (HA.) and hectoliters
(HL.), respectively.

Each year you will have to make the following decisions:

        Grain for food =

You must decide how much grain to feed the peasants.  14 HL. of grain
will just adequately feed one peasant; 13 will cause some hunger and
decrease the peasants' fighting ability, and 12 or fewer will cause
some starvations.  The peasants will complain if you try to starve them
excessively and they know that you are holding back grain.  If you feed
the peasants more than 14 HL. each (up to a maximum of 18) they will
appreciate the boon and fight better in any war the following summer.
A long term memory keeps track of the peasants' cumulative attitude (it
fades slowly with time) and if you create sufficient bad will (by
underfeeding them, for instance) they will depose you.  You may enter
the quantity of grain for the peasants in two ways:  Numbers less than
100 are interpreted as hectoliters-per-peasant, while an entry of 100
or more represents the total amount for the entire population.

        Land to buy at nn HL./HA. =

Enter the number of hectares of land you want to buy.  The prices
offered vary from about 4 hectoliters/hectare to about 30, depending
primarily on last year's crop yield.  If you don't want to buy any
land, enter 0.  You will then be given the option of selling your land
at a price one unit lower than the buying price.  Enter the number of
hectares you want to sell, or enter 0 if you don't want to sell any.

        Land to plant =

Enter the number of hectares you wish to plant.  Each hectare planted
will require 2 hectoliters of grain to seed it.  Also, remember that
each peasant can plant and care for no more than 4 hectares.  There is
no fertilizer and no alternate crop, so land used many years in a row
becomes depleted.  The annual report lists the number of hectares you
have of each of six classes from 100% yield to 0%.  In any given year,
land used in any class moves 1 step closer to being totally depleted
while unused land moves two steps closer to fallow (100%).  The best
quality land will always be planted first.  The yield for fallow land
is calculated each year at random (variances in the weather) and ranges
from 4 to 13 hectoliters of grain harvested for each hectare planted.
The actual yield obtained will be the average generated by the various
qualities of land used.

        Special Operating Instructions

When a response is prompted by a "?", a Y or N may be given for Yes or
No, respectively.  A simple return will be assumed to be a "N" response.

When a response is prompted by an "=", a non-negative integer is
required.  Any fraction will be trimmed from input, and a simple return
will be interpreted as an entry of 0.

This version of DUKEDOM allows the player to have the printing of
the long detailed reports omitted from the game.  A beginner should
respond "N" in order to receive the long but helpful reports.  An
experienced DUKEDOM player seldom if ever needs these reports and
once a response is given, the option is set and the game must be
re-run from the beginning in order to change the option, unless
^C breaking the program and setting R$="Y" or R$="N" (the option
yes/no flag you choose) then CONTinuing is convenient.

*EOF*

Additional information on DUKEDOM (Microcomputer Version)
        or
Welcome to medievalworld!  Boy, have we got a vacation for you...
```

ACTION, STRATEGY, AND FANTASY
for the SERIOUS games player

Brain Games - 1 demands ingenuity.

Two players bombard radioactive material with protons and electrons until it reaches critical mass and sets up a ***Nuclear Reaction. Dodgem*** *requires you to outmaneuver another player to get your pieces across the board first.* ***Dueling Digits*** *and* ***Parrot*** *challenges your ability to replicate number and letter sequences.* ***Tones*** *lets you make music with your Apple (16K) CS-4004 $7.95.* ***Strategy Games*** *and* ***Brain Games*** *are on one disk (16K) CS-4503 $14.95.*

THINK

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IMAGINE

You're in command in *Space Games* - 1.

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General Information

Running totals are maintained by the computer. All additions and subtractions are made at once and further transactions are limited by the current balance. No credit is allowed (with one exception).

One hectare of land equals about 2.5 acres. One hectoliter of grain equals about 2.8 bushels.

It is (usually) necessary to gamble occasionly to win. Most gambles consist of buying land you can't afford at very low prices and gambling that yield will be high and there won't be a war. If the gamble fails, you will spend the next ten years recovering (if you survive, that is).

Food Allocation

By overfeeding the peasants when possible, you can build up good will among the population. This may save your life as it can counteract unavoidable resentment in the future (during times of famine, for instance). Judge Lynch never sleeps!

Land Trading

When you buy land you always receive 60% quality. When you sell land the machine sells your 60% land until used up, then the 80% quality and finally the 100% if you sell that much. You can never sell 40% (or poorer) quality land; no buyers will accept it.

There is another limit on land sales: You cannot sell more than 4000 HL. worth in any one year. That's all the grain available to pay you with.

Crop Hazards

Sometimes the rats get into the granery and eat up to 10% or so of your reserve grain. Rats never eat field grain -- field grain is eaten by the seven year locusts. They eat half of all your crop in the years that they appear. The yield printed in these years already includes locust losses.

The King's Peasant Levy

Occasionly rats will eat so much of the High King's grain that some of his workers starve to death. When this happens, the King will require some peasants from each of his Dukes as replacements. You may supply them as requested or pay an alternate amount of grain.

Wars

Neighboring Dukes may attack you, hoping to obtain some land. This is more probable in years of poor crop yield. It is no secret and you can attack first if you wish. This means that you and your peasants go over there some night and burn a few huts and generally make a great din. If your attack is impressive, the nearby Duke may cancel his war plans. This depends on the size of your attack force and the size of his current defense force. You will certainly lose some peasants in such an attack.

If your first attack fails, or if you do not elect to attack first, the war will occur. You had better hire some mercenaries since your enemy is doing the same. A mercenary is worth about 8 peasants in fighting power. Mercenaries cost 40 HL. each and there is a maximum of 75 mercenaries available to you. If your fighting power (mercenaries + peasants) exceeds your enemy's, you win; otherwise he wins. The winner acquires land from the loser in ratio to the size of the win. How much you fed the peasants last fall is now important and may occasionly make the difference between a win and a loss.

The winner also picks up some grain from the captured land and is able to harvest the captured land along with his own (at the same yield as his original land). The land acquired (or lost) will appear in next year's land quality table evenly distributed between the 100%, 80%, and 60% categories.

Since the mercenaries are horse mounted and the peasants are on foot, the mercenaries attack first. Thus, a large number of mercenaries will keep down your peasant losses whether you win or lose. The mercenaries must be paid after the battle. You can use granery reserves and the actual grain captured from acquired land (the one exception to the no-credit rule), but not the anticipated harvest (the mercenaries want their pay NOW).

If you can't pay all the mercenaries, they will attack your peasants, killing them and collecting grain from their huts until fully paid. Since the peasants don't have much grain left this late in the season, even a small default may cost you a lot of peasants. Incidentally, if the mercenaries do turn on the peasants, they also rape every female in the Duchy, making next year's birth rate very high. (We ignore the fact that the women deliver only a few months later -- these are no ordinary mercenaries.)

All peasant deaths from war cause resentment to build up against you. Attack by your own mercenaries is quite heavily resented.

Plagues and Poxes

The plague will kill off a third of the population, but in so doing it confers a 13 year immunity on the survivors. Therefore the plague cannot occur again for at least 13 years.

The pox is less deadly; it kills 10% or fewer peasants but confers no immunity. It can occur several years in a row.

Taxes and Expenses

The High King charges a tax of 1/2 HL. of grain for each HA. of land you possess (after war gains or losses). You had better be able to pay.

After the grain is harvested it must be milled. The castle granery can mill a maximum of 4000 HL. during the year. Additional harvest must be sent to the village miller at a charge of 10% of the amount milled. This amount is added to the castle overhead which is fixed at 120 HL. per year.

Births and Deaths

During the year, some natural deaths and numerous births have occured. Both are lumped together as if they occur just after the fall harvest.

The computer now prints out the results for the year and you start over again with the peasant's food decision.

Winning the Game

Through astute land management, profitable real-estate trading, winning a few wars and lots of luck, you may be able to build up your Duchy. If instead you let it decline, the High King may take it away from you and select a new manager. An unemployed Duke can find employment as a mercenary in somebody else's game.

Prosperity brings its risks. If you get too prosperous, the High King may become worried and begin to subsidize wars against you. These subsidies get larger as the game progresses.

If you should persevere, you may eventually beat some Duke so badly that you succeed in taking over his entire Duchy. In addition to the more than 400 HA. of land you will obtain, you get all of his surviving peasants (your war casualties will be positive) and the remaining contents of his granery. This poses a real threat to the crown and the High King will begin planning a direct attack against you. At the beginning of the following year the King will demand twice the usual tax. You may pay it and continue the game as usual, or you may refuse. You will never be rid of the double tax once it starts unless you refuse to pay it. This constitutes defiance of your Leige Lord and the King has his excuse for attacking you directly. The rest of the year will go as usual except that there will be no tax at all (no peasant levies either) and there will be no war threats (nobody dares).

The following year the King will attack just before planting time. You will have to hire as many foreign mercenaries as possible at 100 HL. each, grain in advance (the loser won't be in any position to pay). The program will automatically hire as many mercenaries as you can afford at the time. There is no limit to the number of foreign mercenaries you can hire except your current grain holdings. Each mercenary has as much fighting power as 8 peasants. If your total fighting strength is greater than the King's, you win. 250 to 300 mercenaries ought to be enough, depending on how many peasants you have.

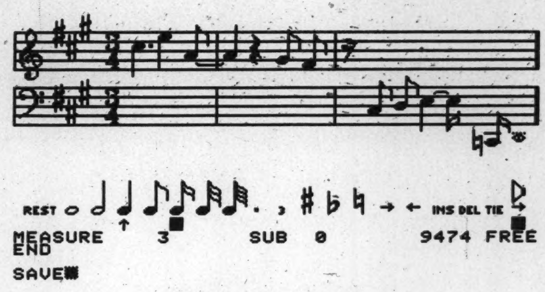
Either way, the game is over. Good Luck!

Historical Waiver

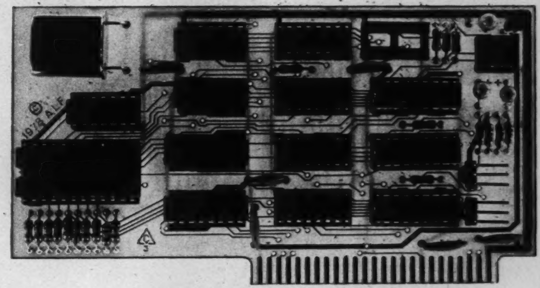
No historical accuracy is implied in any way by this game. Except for the grain yields and planting requirements, the game is almost pure fiction. There were few mercenaries, Dukes did not often fight each other nor readily buy and sell land, the church was a power to be feared. The metric system had not yet been developed and the seven year locusts were not so reliable.

A Duke would have as his lord not a King but a Count or Earl and would have under him Barons or Marquises. There various nobles were the fighting force of the Kingdom (peasants did not fight). Taxes were paid not in grain but in periods of military service. (Yes, the National Guard was a medieval invention -- at the latest.)

APPLE MUSIC



MUSIC ENTRY SCREEN



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With ALF's Entry program, you can quickly and easily insert, change, and delete notes; add new parts (up to nine); change time and key signatures; repeat sections or make "rounds"; and change sound parameters at any point in the song.

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Credits

Original HAMMURABI game concept by Rick Merrill and David Ahl (1969)
KINGDOM program written by Lee Schneider and Todd Voros (1974) and
        distributed by Digital Equipment Corporation and, later,
        Data General Corporation
Original DUKEDOM program (loosely based on the
        KINGDOM program) written in D-level PL/I by
        Vince Talbot, Loyola Marymount University, Los Angeles
Rewritten (with extensive revision) in I.T.S. EXBASIC by
        Jamie E. Hanrahan
Adapted for /GAMES/ by David C. Barber
Re-written from I.T.S. EXBASIC to Hewlett-Packard level F BASIC
        then to DEC RSTS/E BASIC-PLUS then to Microsoft CP/M
        Disk BASIC by Richard A. Kaapke

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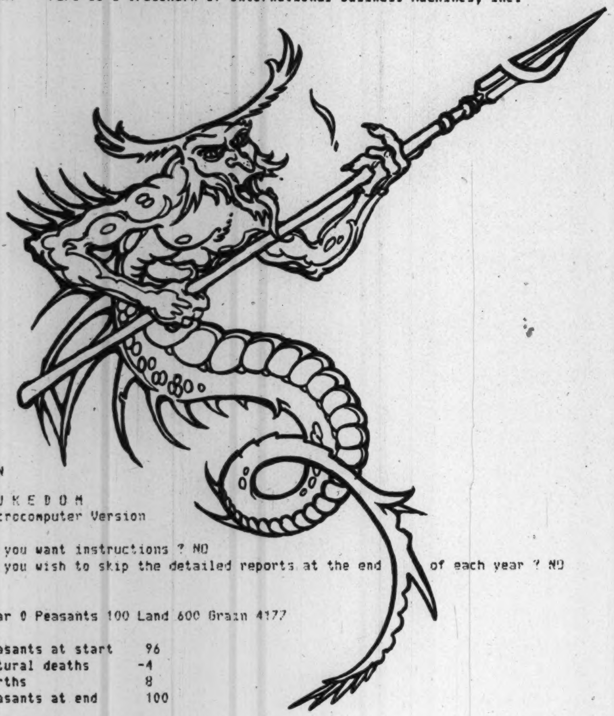

```
RUN

D U K E D O M
Microcomputer Version

Do you want instructions ? NO
Do you wish to skip the detailed reports at the end of each year ? NO


Year 0 Peasants 100 Land 600 Grain 4177

Peasants at start     96
Natural deaths        -4
Births                 8
Peasants at end      100

Land at start        600
Land at end          600

100%  80%  60%  40%  20% Depl
 216  200  184    0    0    0

Grain at start       5193
Used for food       -1344
Seedings            -768
Crop yield           1516
Castle expense      -120
Royal tax           -300
Grain at end         4177

(Severe crop damage due to seven year locusts)


Grain for food = 15
Land to buy at 6 HL./HA. = 100
Land to plant = 400
Yield = 9.98 HL./HA.
Rats infest the grainery
The High King requires 3 peasants for his estates
and mines.  Will you supply them (Yes) or pay 300
HL. of grain instead (No) ? YES
```

```
Year 1 Peasants 101 Land 700 Grain 4629

Peasants at start     100
King's levy           -3
Natural deaths        -5
Births                 9
Peasants at end       101

Land at start         600
Bought/sold           100
Land at end           700

100%  80%  60%  40%  20% Depl
 300  216  184    0    0    0

Grain at start        4177
Used for food        -1500
Land deals           -600
Seedings             -800
Rat losses           -169
Crop yield            3991
Castle expense       -120
Royal tax            -350
Grain at end          4629


Grain for food = 15
Land to buy at 17 HL./HA. = 0
Land to sell at 16 HL./HA. = 100
Land to plant = 400
Yield = 10.45 HL./HA.
Rats infest the grainery
The High King requires 2 peasants for his estates
and mines.  Will you supply them (Yes) or pay 200
HL. of grain instead (No) ? YES



Year 2 Peasants 103 Land 600 Grain 7185

Peasants at start     101
King's levy          -2
Natural deaths       -5
Births                9
Peasants at end       103

Land at start         700
Bought/sold          -100
Land at end           600

100%  80%  60%  40%  20% Depl
 200  300  100    0    0    0

Grain at start        4629
Used for food        -1515
Land deals            1600
Seedings             -800
Rat losses           -471
Crop yield            4180
Castle expense       -138
Royal tax            -300
Grain at end          7185


Grain for food = 15
Land to buy at 18 HL./HA. = 0
Land to sell at 17 HL./HA. = 100
Land to plant = 400
Yield = 8.1 HL./HA.
Rats infest the grainery
The High King requires 3 peasants for his estates
and mines.  Will you supply them (Yes) or pay 300
HL. of grain instead (No) ? Y


Year 3 Peasants 107 Land 500 Grain 8623

Peasants at start     103
King's levy          -3
Natural deaths       -5
Births                12
Peasants at end       107

Land at start         600
Bought/sold          -100
Land at end           500

100%  80%  60%  40%  20% Depl
 100  200  200    0    0    0
```

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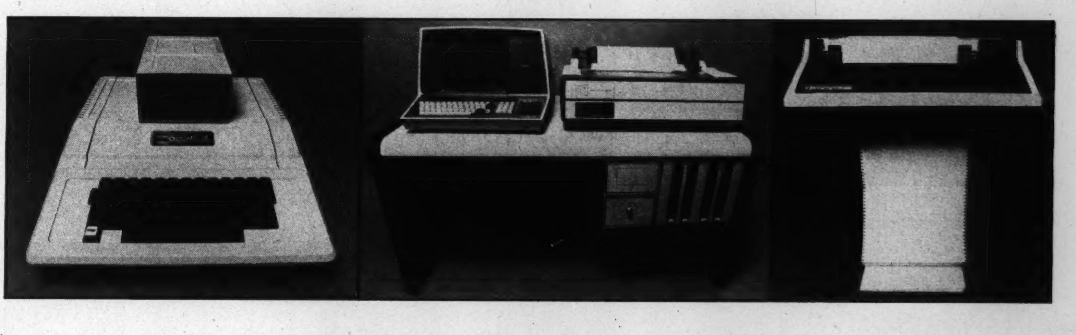


SUNSHINE COMPUTER COMPANY
The Sensible Alternative.

CIRCLE 194 ON READER SERVICE CARD

```
Grain at start       7185
Used for food       -1545
Land deals           1700
Seedings            -800
Rat losses          -787
Crop yield           3240
Castle expense      -120
Royal tax           -250
Grain at end         8623

Grain for food = 15
Land to buy at 15 HL./HA. = 0
Land to sell at 14 HL./HA. = 0
Land to plant = 400
Yield = 6.4 HL./HA.
Rats infest the grainery
```

```
Year 4 Peasants 112 Land 500 Grain 7659

Peasants at start    107
Natural deaths       -5
Births               10
Peasants at end      112

Land at start        500
Land at end          500

100%  80%  60%  40%  20% Depl
 100  100  200  100    0    0

Grain at start       8623
Used for food       -1605
Seedings            -800
Rat losses          -749
Crop yield           2560
Castle expense      -120
Royal tax           -250
Grain at end         7659

Grain for food = 154
The peasants demonstrate before the castle
with sharpened scythes
Grain for food = 15
Land to buy at 12 HL./HA. = 0
Land to sell at 11 HL./HA. = 0
Land to plant = 400
Yield = 6.75 HL./HA.
Rats infest the grainery

Year 5 Peasants 119 Land 500 Grain 6823
```

```
Peasants at start    112
Natural deaths       -5
Births               12
Peasants at end      119

Land at start        500
Land at end          500

100%  80%  60%  40%  20% Depl
   0  200  100  200    0    0

Grain at start       7659
Used for food       -1680
Seedings            -800
Rat losses          -686
Crop yield           2700
Castle expense      -120
Royal tax           -250
Grain at end         6823

Grain for food = 13
Land to buy at 13 HL./HA. = 0
Land to sell at 12 HL./HA. = 0
Land to plant = 470
Yield = 4.28 HL./HA.
Rats infest the grainery
A nearby Duke threatens war; Will you attack first ? NO
How many mercenaries will you hire at 40 HL. each = 40
You have won the war

Year 6 Peasants 121 Land 563 Grain 4059

Peasants at start    119
War casualties       -7
Natural deaths       -5
Births               14
Peasants at end      121

Land at start        500
Fruits of war        63
Land at end          563

100%  80%  60%  40%  20% Depl
  21   51  221  100  170    0

Grain at start       6823
Used for food       -1547
Seedings            -940
Rat losses          -574
Mercenary hire      -1600
Fruits of war        107
Crop yield           2191
Castle expense      -120
Royal tax           -281
Grain at end         4059


Grain for food = 14
Land to buy at 5 HL./HA. = 50
Land to plant = 450
Seven year locusts
Yield = 2.65 HL./HA.
A nearby Duke threatens war; Will you attack first ? YES
Peace negotiations were successful

Year 7 Peasants 122 Land 613 Grain 1981

Peasants at start    121
War casualties       -8
Natural deaths       -5
Births               14
Peasants at end      122

Land at start        563
Bought/sold          50
Land at end          613

100%  80%  60%  40%  20% Depl
   0   21  214  271  100    7

Grain at start       4059
Used for food       -1694
Land deals          -250
Seedings            -900
Crop yield           1192
Castle expense      -120
Royal tax           -306
Grain at end         1981


Grain for food = 10
The peasants demonstrate before the castle
with sharpened scythes
Grain for food = 1981
Land to buy at 4 HL./HA. = 0
Land to sell at 3 HL./HA. = 100
The High King appropiates half your earnings
as punishment for selling at such a low price
Land to plant = 400
But you don't have enough grain
You have 150 HL. of grain left.
Enough to plant 75 HA. of land
Land to plant = 75
Yield = 7.21 HL./HA.


Year 8 Peasants 136 Land 513 Grain 164

Peasants at start    122
Natural deaths       -6
Births               20
Peasants at end      136

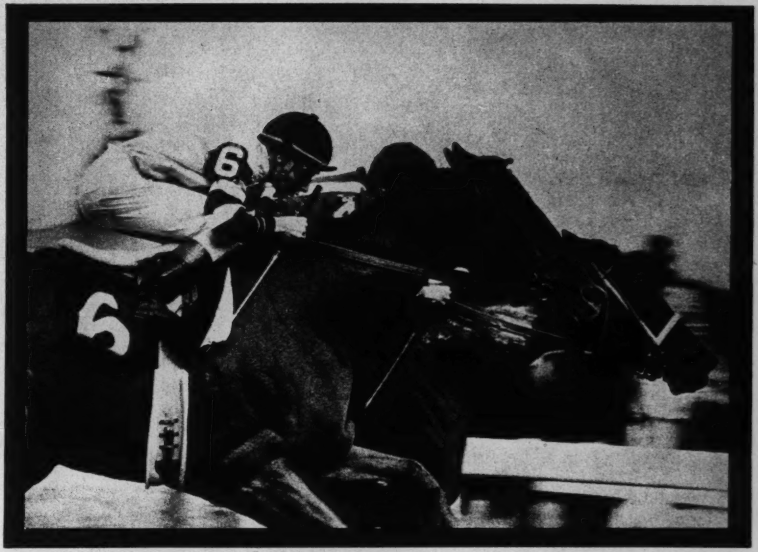
Land at start        613
Bought/sold         -100
Land at end          513

100%  80%  60%  40%  20% Depl
  60  271  121   61    0    0

Grain at start       1981
Used for food       -1981
Land deals           150
Seedings            -150
Crop yield           540
Castle expense      -120
Royal tax           -256
Grain at end         164


The peasants tire of war and starvation
You are deposed
```

THOROUGHBRED HANDICAPPING HAS ENTERED THE COMPUTER AGE



Thoroughvest is an organization of computer programmers and consultants aimed at obtaining the most valid information available on the science of thoroughbred handicapping. Their goal was to find a mathematical method which would produce a positive return on the dollar at the track. To accomplish this, a major **computer based research & development project** was started. It ended **3 years and $30,000 later.**

During that time a data base was created containing **every conceivable handicapping factor for over 16,000 thoroughbreds in over 2,000 races.** Each factor was analyzed by the computer to determine it's relative degree of importance. **Only those factors which produced the highest return on the dollar were considered for further study.** Using the proper computer programs, these factors were then tested to determine their effect on each other. This was necessary because **using too many factors to handicap a race will produce the same negative results as using too few.** After an additional **1,200 hours of analysis**, the method was completed.

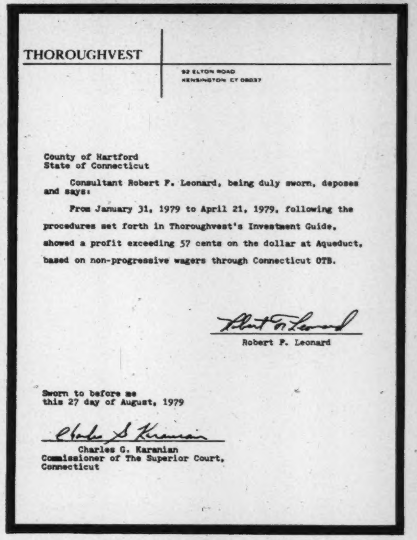
Thoroughvest conducted a **3 MONTH** test at Aqueduct. **Averaging 4 or more races per day PROFITS EXCEEDED 57 CENTS ON THE DOLLAR** at Connecticut **OTB**. These results are fully **documented** and have been **certified valid.**

This record was compiled during mid-winter, the worst possible time of the year. **Many races were played during rain or snow with track conditions ranging from sloppy to muddy.**

Thoroughbred racing should not be treated as an expensive game but rather as a profitable business. When considering an investment, the main concern should be the return on each dollar. Among the nation's top investors, a 10% to 15% return per year is considered excellent. Imagine how they'd feel about **57% in 3 MONTHS!**

Even the strongest willed person lets emotion influence his decisions at the track. **Thoroughvest's investment method is a 100% mechanical procedure** that outthinks the "experts" at a price. **Personal judgments are never required.** Last minute track information, post parade and paddock inspection were proven unnecessary.

CIRCLE 199 ON READER SERVICE CARD



THOROUGHVEST

92 ELTON ROAD
KENSINGTON CT 06037

County of Hartford
State of Connecticut

Consultant Robert F. Leonard, being duly sworn, deposes and says:

From January 31, 1979 to April 21, 1979, following the procedures set forth in Thoroughvest's Investment Guide, showed a profit exceeding 57 cents on the dollar at Aqueduct, based on non-progressive wagers through Connecticut OTB.

Robert F. Leonard

Sworn to before me
this 27 day of August, 1979

Charles G. Karanian
Commissioner of The Superior Court,
Connecticut

When Thoroughvest began their research 4 years ago, the computer boom was not anticipated. Inevitably, similar projects will be started due to the present availability of low cost computer systems. Having enjoyed a one year advantage at the 3 major racing circuits in the United States, Thoroughvest now decided to release their **Investment Guide.** All computer programs are reduced to simple arithmetic. **The guide is easy to use and to the point.** After all, it wasn't written to enrich you on the subject of racing, it just produces a **steady return on your invested dollar.** A **LIFETIME MONEYBACK WARRANTY** is included.

For those who presently own a home computer or intend to purchase one in the future, a **PROGRAM LISTING** which allows your system to make the objective forecasts is included. **It is offered free of charge and was designed to be compatible with all systems** operating with an 8K Basic and having 8K free memory. If your system meets these requirements and the program fails to execute properly, you may return it for modifications. It is one of the most complete and comprehensive programs available.

You will also receive a **complimentary one month subscription to Thoroughvest's newsletter.** Subscribers are updated on the latest developments by the computer, and the results are summarized **using Track or Connecticut OTB prices.**

If you have any questions now or need any help or advice when you receive the Investment Guide, simply write Thoroughvest and you will be answered personally within 24 hours.

THOROUGHVEST 92 ELTON ROAD KENSINGTON, CT 06037

☐ Please send me the Investment Guide by first-class mail. I understand that it is offered with a Lifetime Moneyback Warranty. I enclose $50.00 to cover all costs.

Although Thoroughvest's Newsletter is invaluable to all handicappers, results are summarized, at this time, only for Aqueduct, Belmont and Saratoga. For your complimentary one month subscription, you may choose between Track or Connecticut OTB prices. ☐ Track ☐ Connecticut OTB

☐ I do not own a home computer, but include the free Program Listing.

☐ I own a ____________________ computer system, include the free Program Listing.

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City ____________ State ____________ Zip ____________

☐ Payment enclosed ☐ Charge my: ☐ Visa ☐ Master Charge

Account # ____________ Expiration Date ____________

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```
LIST
1000    CLEAR 400:
        '
        '                 D U K E D O M  --  MICROCOMPUTER VERSION
        '
1002    DEF FNR%(Q1%, Q2%) = RND(1) * (1 +Q2% -Q1%) +Q1%
1003    DEF FNX%(Q1%) = FNR%(-F3%, F3%) + R(Q1%)
1010    GOTO 1620        ' SKIP SUBROUTINE DEFINITIONS
        '
        '       DECLARATIONS AND SUBPROGRAM DEFINITIONS
        '
1030    DIM P(8), L(3), G(10), S(6), U(6), R(8), P$(8), L$(3), G$(10)
1040    '       ---PARTIALLY GAUSSIAN RANDOM NUMBERS
1050    Q3% = FNR%(Q1%, Q2%):
        IF FNR%(Q1%, Q2%) > 5 THEN G0% = (Q3% +FNR%(Q1%, Q2%))/2
           ELSE G0% = Q3%
1060    RETURN
        '       ---READ A YES-OR-NO RESPONSE
1330    LINE INPUT V$ : V$ = LEFT$(V$, 1):
        IF LEN(V$)=0 THEN V$="N" ELSE
        IF ASC(V$) > 95 THEN V$ = CHR$(ASC(V$)-32)
1332    IF V$="N" OR V$="Y" THEN RETURN ELSE
        PRINT "Please answer Yes or No: ";:  GOTO 1330
        '       ---READ A NUMERIC RESPONSE
1430    LINE INPUT V$ : V = INT(VAL(V$)):
        IF V >=0 THEN RETURN ELSE
        PRINT "Please enter a non-negative number: ";:  GOTO 1430
        '       ---COMMON ERROR MESSAGES
1530    PRINT "But you don't have enough grain":
        PRINT "You have" G "HL. of grain left,":
        IF X1>=4 THEN PRINT "Enough to buy" INT(G/X1) "HA. of land"
1531    PRINT "Enough to plant" INT(G/2) "HA. of land":
        RETURN
1550    PRINT "But you don't have enough land":
        PRINT "You only have" L "HA. of land left":
        RETURN
1570    PRINT "But you don't have enough peasants":
        PRINT "Your peasants can only plant" 4*P "HA. of land":
        RETURN
        '
        '       INTRODUCTION TO PROGRAM
        '
1620    PRINT: PRINT "D U K E D O M": PRINT "Microcomputer Version":
        PRINT: PRINT "Do you want instructions ? ";:  GOSUB 1330:
        IF V$="N" THEN 2050
1690    OPEN "I", 2, "DUKEDOM.INS"
1700    LINE INPUT #2, V$
1701    IF LEFT$(V$,5)<>"*EOF*" THEN PRINT V$:  GOTO 1700
1710    PRINT "Do you require a more detailed description
        (it's LONG) ? ";:  GOSUB 1330:
        IF V$="N" THEN 2050
1720    IF EOF(2) THEN 2050 ELSE
        LINE INPUT #2, V$:  PRINT V$:  GOTO 1720
        '       ---ONCE ONLY INTIIALIZATION
2050    CLOSE 2:
        F3% = 2:  M = 1.95
        '
        '       START NEW GAME
        '
2100    PRINT "Do you wish to skip the detailed reports at the end
        of each year ? ";: GOSUB 1330:  R$ = V$
2180    READ Y%, C1, U1, U2, K%, D, P, L, G
2190    FOR I% = 1 TO 8:  READ P(I%):  NEXT:
        FOR I% = 1 TO 3:  READ L(I%):  NEXT:
        FOR I% = 1 TO 10: READ G(I%):  NEXT:
        FOR I% = 1 TO 6:  READ S(I%):  NEXT:
        FOR I% = 1 TO 8:  READ P$(I%):  NEXT:
        FOR I% = 1 TO 3:  READ L$(I%):  NEXT
2195    FOR I% = 1 TO 10:  READ G$(I%):  NEXT
        ' AND CURSE THIS BASIC FOR NOT HAVING MAT FUNCTIONS '
2200    RESTORE
2210    DATA    0, 3.95, 0, 0, 0, 0, 100, 600, 4177,
                96, 0, 0, 0, 0, 0, -4, 8,
                600, 0, 0,
                5193, -1344, 0, -768, 0, 0, 0, 1516, -120, -300,
                216, 200, 184, 0, 0, 0
2260    '
        '       INITIALIZE RANDOM BASE TABLE
        '
2270    Q1% = 4:  Q2% = 7:  GOSUB 1050:  R(1) = G0%:
        Q2% = 8:  GOSUB 1050:  R(2) = G0%:
        Q2% = 6:  GOSUB 1050:  R(3) = G0%:
        Q1% = 3:  Q2% = 8:  GOSUB 1050:  R(4) = G0%:
        Q1% = 5:  GOSUB 1050:  R(5) = G0%:
        Q1% = 3:  Q2% = 6:  GOSUB 1050:  R(6) = G0%
2271    Q2% = 8:  GOSUB 1050:  R(7) = G0%:
        Q1% = 4:  GOSUB 1050:  R(8) = G0%
        '
        '       DISPLAY LAST YEAR'S RESULTS
        '
2460    PRINT: PRINT: PRINT "Year" Y% "Peasants" P "Land" L "Grain"
        G: PRINT
2500    IF R$="Y" THEN 2810      ' SKIP LONG REPORT IF NOT WANTED
```

N
NW
NE
W
E
SW
SE
S

```
2510    FOR J1% = 1 TO 8:
           IF P(J1%)<>0 OR J1%=1 THEN PRINT P$(J1%); TAB(20); P(J1%)
2520    NEXT J1%:
        PRINT "Peasants at end"; TAB(20); P: PRINT
2600    FOR J1% = 1 TO 3:
           IF L(J1%)<>0 OR J1%=1 THEN PRINT L$(J1%); TAB(20); L(J1%)
2610    NEXT J1%:
        PRINT "Land at end"; TAB(20); L: PRINT
2690    PRINT "100%  80%  60%  40%  20% Depl":
        PRINT USING "####"; S(1);:
        FOR J1% = 2 TO 6:
           PRINT USING "#####"; S(J1%);:
        NEXT J1%:  PRINT:  PRINT
2720    FOR J1% = 1 TO 10:
           IF G(J1%)<>0 OR J1%=1 THEN PRINT G$(J1%); TAB(20); G(J1%)
2730    NEXT J1%:
        PRINT "Grain at end"; TAB(20); G: PRINT
2800    IF Y%<=0 THEN PRINT "(Severe crop damage due to seven year locusts)"
2810    PRINT: PRINT:  Y% = Y%+1:
        FOR I% = 1 TO 8:  P(I%) = 0:  NEXT:
        FOR I% = 1 TO 3:  L(I%) = 0:  NEXT:
        FOR I% = 1 TO 10: G(I%) = 0:  NEXT
2815    P(1) = P:  L(1) = L:  G(1) = G
        '
        '       TEST FOR END-OF-GAME CONDITIONS
        '
2980    IF P >= 33 THEN 3040 ELSE
        PRINT "You have so few peasants left that"
3000    PRINT "the High King has abolished your Ducal right":
        PRINT:  GOTO 30000
3040    IF L >= 199 THEN 3070 ELSE
        PRINT "You have so little land left that":  GOTO 3100
3070    IF U1 > 88 OR U2 > 99 THEN 3100 ELSE
        IF G >= 429 THEN 3130
3100    PRINT "The peasants tire of war and starvation":
        PRINT "You are deposed":  PRINT:  GOTO 30000
3130    IF Y% > 45 AND K% = 0 THEN
        PRINT "You have reached the age of mandatory retirement":
        GOTO 30000
3170    U1 = 0:
        IF K% > 0 THEN PRINT "The King demands twice the royal tax in the":
           PRINT "hope of provoking war.  Will you pay ? ";:
           GOSUB 1330:  K% = 2:
           IF V$="N" THEN K% = -1
        '
        '       FOOD FOR THE PEASANTS
        '
3270    PRINT "Grain for food = ";:
        GOSUB 1430 : V = -V*(V>=100) -V*P*(V<100):
        IF V > G THEN GOSUB 1530:  GOTO 3270
3350    IF V/P < 11 AND V<>G THEN
           PRINT "The peasants demonstrate before the castle":
           PRINT "with sharpened scythes":  U1 = U1+3:  GOTO 3270
3410    G(2) = -V:  G = G+G(2)
        '       ---STARVATION AND UNREST CALCULATIONS
3440    X1 = V/P:
        IF X1 < 13 THEN PRINT "Some peasants have starved during the winter"
        P(2) = -INT(P-V/13):  P = P+P(2)
3490    X1 = X1-14:  X1 = -X1*(X1<=4) -4*(X1>4):
        U1 = U1 -3*P(2) -2*X1:
        IF U1 > 88 THEN 3100 ELSE
        IF P<33 THEN 2980
        '
        '       PURCHASE OR SALE OF LAND
        '
3580    C = C1:  X1 = INT(2*C+FNX%(1)-5):
        X1 = -X1*(X1>=4) -4*(X1<4)
3640    PRINT "Land to buy at" X1 "HL./HA. = ";:
        GOSUB 1430:  G(3) = -V*X1:
        IF -G(3) > G THEN GOSUB 1530:  GOTO 3640
3700    L(2) = V:  S(3) = S(3) + V:
        IF V>0 THEN 4020 ELSE X2 = S(1)+S(2)+S(3)
3740    FOR J1% = 1 TO 3:
           X1 = X1-1:
           PRINT "Land to sell at" X1 "HL./HA. = ";:
           GOSUB 1430:
           IF V>X2 THEN PRINT "But you only have" X2 "HA. of good land":
              GOTO 3840
3810    G(3) = V*X1:
        IF G(3) <= 4000 THEN 3870 ELSE
        PRINT "No buyers have that much grain - sell less"
3840    NEXT J1%:  PRINT "Buyers have lost interest":
        V = 0:  G(3) = 0
3870    L(2) = -V
3880    FOR J1% = 3 TO 1 STEP -1:
           IF V <= S(J1%) THEN 4010 ELSE
           V = V-S(J1%):  S(J1%) = 0:
        NEXT J1%
        ' LOOP SHOULD NEVER EXIT HERE '
3960    PRINT "LAND SELLING LOOP ERROR - CONTACT PROGRAM AUTHOR IF":
        PRINT "ERROR IS NOT YOURS IN ENTERING PROGRAM,":
        PRINT "AND SEEMS TO BE FAULT OF PROGRAM'S LOGIC.": STOP
4010    S(J1%) = S(J1%) -V
```

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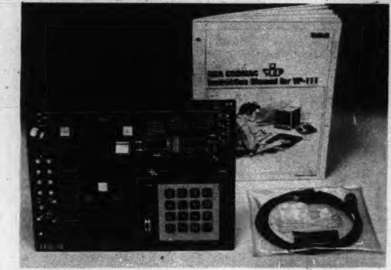

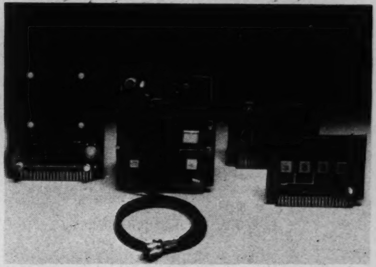

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CIRCLE 178 ON READER SERVICE CARD

```
4020    L = L+L(2):
        IF L<10 THEN 3040 ELSE
        IF L(2)<0 AND X1<4 THEN G(3) = INT(G(3)/2):
           PRINT "The High King appropiates half your earnings":
           PRINT "as punishment for selling at such a low price"
4090    G = G+G(3)
        '
        '       WAR WITH THE KING
        '
4130    IF K%<> -2 THEN 4350 ELSE
        PRINT "The King's army is about to attack your duchy":
        X1 = INT(G/100):
        PRINT "at 100 HL. each (payment in advance)"
4170    PRINT "you have hired" X1 "foreign mercenaries":
        IF 8*X1+P>2399 THEN 4220
4190    PRINT "The placement of your head atop the castle gate":
        PRINT "signifies that ";:  GOTO 3000
4220    PRINT "Wipe the blood from the crown - you are now High King!":
        PRINT: PRINT "A nearby monarchy threatens war; ";:
        PRINT "how many .........":PRINT:PRINT:PRINT:GOTO 32767
        '
        '       GRAIN PRODUCTION
        '
4350    PRINT "Land to plant = ";:  GOSUB 1430:
        IF V>L THEN GOSUB 1550:  GOTO 4350
4360    IF V>4*P THEN GOSUB 1570:  GOTO 4350
4430    G(4) = -2*V:
        IF -G(4) > G THEN GOSUB 1530:  GOTO 4350
4470    G(8) = V:  G = G+G(4)
        '       ---UPDATE LAND TABLES
4500    FOR I% = 1 TO 6:  U(I%) = 0:  NEXT
4510    FOR J1% = 1 TO 6:
           IF V<=S(J1%) THEN 4620 ELSE
           V = V-S(J1%):  U(J1%) = S(J1%):
           S(J1%) = 0:
        NEXT J1%
        '       LOOP SHOULD NEVER REACH THIS FAR
4600    PRINT "LAND TABLE UPDATING ERROR - PLEASE CONTACT PROGRAM AUTHOR":
        PRINT "IF ERROR IS NOT A FAULT OF ENTERING THE PROGRAM, BUT RATHER":
        PRINT "FAULT OF THE PROGRAM LOGIC.": STOP
4620    U(J1%) = V:  S(J1%) = S(J1%) - V:
        S(1) = S(1)+S(2):  S(2) = 0
4660    FOR J1% = 3 TO 6:
           S(J1% -2) = S(J1%-2)+S(J1%):
           S(J1%) = 0:
        NEXT J1%
4700    FOR J1% = 1 TO 5:  S(J1%+1) = S(J1%+1)+U(J1%):  NEXT:
        S(6) = S(6)+U(6)
        '
        '       CROP YIELD AND LOSSES
        '
4770    C = FNX%(2)+3:
        IF INT(Y%/7) * 7 = Y%  THEN PRINT "Seven year locusts":
        C = C/2
4830    X1 = 0:
        FOR J1% = 1 TO 5:
           X1 = X1 + U(J1%) * (1.2 - .2*J1%):
        NEXT J1%:
        IF G(8)=0 THEN C1 = 0:  C = 0:
        ELSE C1 = INT((C *(X1/G(8)))*100)/100:  C = C1
4920    PRINT "Yield =" C "HL./HA.":
        X1 = FNX%(3)+3:
        IF X1 < 9 THEN 5190 ELSE G(5) = -INT((X1*G)/83):
        G = G+G(5)
4990    PRINT "Rats infest the grainery":
        IF P<67 OR K%=-1 THEN 5190 ELSE
        X1 = FNX%(4):
        IF X1> P/30 THEN 5190
5060    PRINT "The High King requires" X1 "peasants for his estates":
        PRINT "and mines.  Will you supply them (Yes) or pay" X1*100:
        PRINT "HL. of grain instead (No) ? ";:  GOSUB 1330:
        IF V$="N" THEN G(10) = -100*X1:  G = G+G(10):  GOTO 5190
5140    P(3) = -X1:  P = P+P(3)
        '
        '       W A R
        '
5190    IF K%=-1 THEN PRINT "The High King calls for peasant levies":
           PRINT "and hires many foreign mercenaries":  K% = -2:  GOTO 6340
5240    X1 = INT(11 - 1.5*C):
        X1 = -X1*(X1>=2) -2*(X1<2):
        IF K%<>0 OR P<=109 OR 17*(L-400)+G <= 10600 THEN 5350
        ELSE PRINT "The High King grows uneasy and may"
5310    PRINT "be subsidizing wars against you":  X1 = X1 +2:
        X2 = Y%+5:  GOTO 5380
5350    X2 = 0
5380    X3 = FNX%(5):
        IF X3>X1 THEN 6340 ELSE
        PRINT "A nearby Duke threatens war; ";:
        X2 = INT(X2+85+18*FNX%(6))
5440    X4 = 1.2-U1/16:  X5 = INT(P*X4)+13:
        PRINT "Will you attack first ? ";:  GOSUB 1330:
        IF V$="N" THEN 5590 ELSE
        IF X2>=X5 THEN 5540 ELSE
        PRINT "Peace negotiations were successful"
```

```
5510    P(4) = -X1-1:  X2 = 0:  GOTO 5570
5540    PRINT "First strike failed - you need professionals":
        P(4) = -X3-X1-2:  X2 = X2+3*P(4)
5570    P = P+P(4):
        IF X2<1 THEN U1 = U1-2*P(4)-3*P(5):  GOTO 6340
5590    PRINT "How many mercenaries will you hire at 40 HL. each = ";:
        GOSUB 1430:
        IF V>75 THEN
           PRINT "There are only 75 mercenaries available for hire":
           GOTO 5590
5640    X2 = INT(X2*M):  X5 = INT(P*X4)+7*V+:3:
        X6 = X2-4*V-INT(.25*X5):  X2 = X5-X2:
        L(3) = INT(.8*X2):
        IF -L(3)>.67*L THEN
           PRINT "You have been overrun and have lost the entire Dukedom":
           GOTO 4190
5720    X1 = L(3)
5730    FOR J1% = 1 TO 3:
           X3 = INT(X1/(4-J1%)):
           IF -X3 <= S(J1%) THEN X5 = X3 ELSE X5 = -S(J1%)
5790       S(J1%) = S(J1%) + X5:
           X1 = X1-X5:
        NEXT J1%
5820    FOR J1% = 4 TO 6:
           IF -X1 <= S(J1%) THEN X5 = X1 ELSE X5 = -S(J1%)
5870       S(J1%) = S(J1%) + X5:
           X1 = X1-X5:
        NEXT J1%
5900    IF L(3)<399 THEN 6010 ELSE
        PRINT "You have overrun the enemy and annexed his entire Dukedom":
        G(7) = 3513:  G = G+G(7):  X6 = -47:  X4 = .55:
        IF K%>0 THEN 6130
5970    K% = 1:
        PRINT "The King fears for his throne and":
        PRINT "may be planning direct action":  GOTO 6130
6010    IF X2>=0 THEN
           PRINT "You have won the war":  X4 = .67:
           G(7) = INT(1.7*L(3)) : G = G+G(7):  GOTO 6090
6070    PRINT "You have lost the war":  X4 = G(8)/L
6090    IF X6<=9 THEN X6 = 0 ELSE X6 = INT(X6/10)
6130    X6 = -X6*(X6<=P) -P*(X6>P):  P(4) = P(4)-X6:
        P = P-X6:  G(8) = G(8)+INT(X4*L(3)):
        X6 = 40*V:
        IF X6 <= G THEN G(6) = -X6 ELSE G(6) = -G:
           P(5) = -INT((X6-G)/7)-1: PRINT "There isn't enough grain to
           pay the mercenaries"
6250    G = G+G(6):
        P(5) = -P(5)*(-P(5)<=P) +P*(-P(5)>P):
        P = P+P(5):
        L = L+L(3):  U1 = U1-2*P(4)-3*P(5)
        '
        '       PLAGUES, BIRTHS, NATURAL DEATHS
        '
6340    X1 = FNX%(7):
        IF X1>3 THEN 6500 ELSE
        IF X1<>1 THEN 6440 ELSE
        IF D>0 THEN 6500 ELSE
        PRINT "The BLACK PLAGUE has struck the area":
        D = 13:  X2 = 3
6430    P(6) = -INT(P/X2):  P = P+P(6):  GOTO 6500
6440    PRINT "A POX EPIDEMIC has broken out":  X2 = X1*5:
        P(6) = -INT(P/X2):  P = P+P(6)
6500    X1 = FNX%(8)+4:
        X1 = -X1*(P(5)=0) -4.5*(P(5)<>0):  P(8) = INT(P/X1):
        P(7) = INT(.3-P/22):  P = P+P(7)+P(8):  D = D-1
        '
        '       GRAIN HARVEST, CASTLE EXPENSES, KING'S TAX
        '
6600    G(8) = INT(C*G(8)):  G = G+G(8):  X1 = G(8)-4000:
        G(9) = -G(9)*(X1<=0) +INT(.1*X1)*(X1>0):  G(9) = G(9)-120:
        G = G+G(9)
6670    IF K%<0 THEN 6790 ELSE X1 = -INT(L/2)
6710    X1 = -X1*(K%<2) -2*X1*(K%>=2):
        IF -X1>G THEN
           PRINT "You have insufficient grain to pay the royal tax":
           GOTO 3000
6740    G(10) = G(10)+X1:  G = G+X1
        '
        '       UPDATE UNREST COUNTER AND CONTINUE
        '
6790    U2 = INT(U2*.85)+U1:  GOTO 2460
7000    DATA    "Peasants at start", "Starvations", "King's levy",
                "War casualties", "Looting victims", "Disease victims",
                "Natural deaths", "Births"
7100    DATA    "Land at start", "Bought/sold", "Fruits of war"
7200    DATA    "Grain at start", "Used for food", "Land deals",
                "Seedings", "Rat losses", "Mercenary hire",
                "Fruits of war", "Crop yield", "Castle expense",
                "Royal tax"
30000   PRINT:PRINT "Do you wish to try another game ? ";:  GOSUB 1330:
        IF V$="Y" THEN 2180
32767   END '
Ok
```

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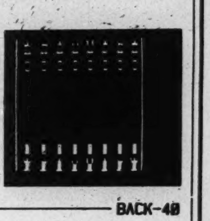

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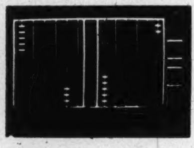

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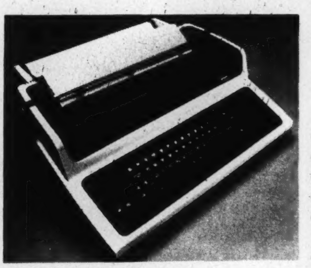

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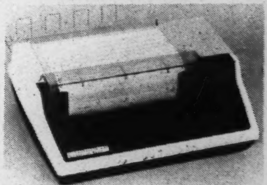

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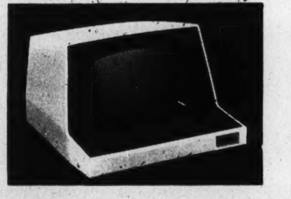

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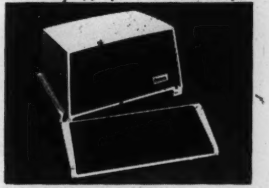

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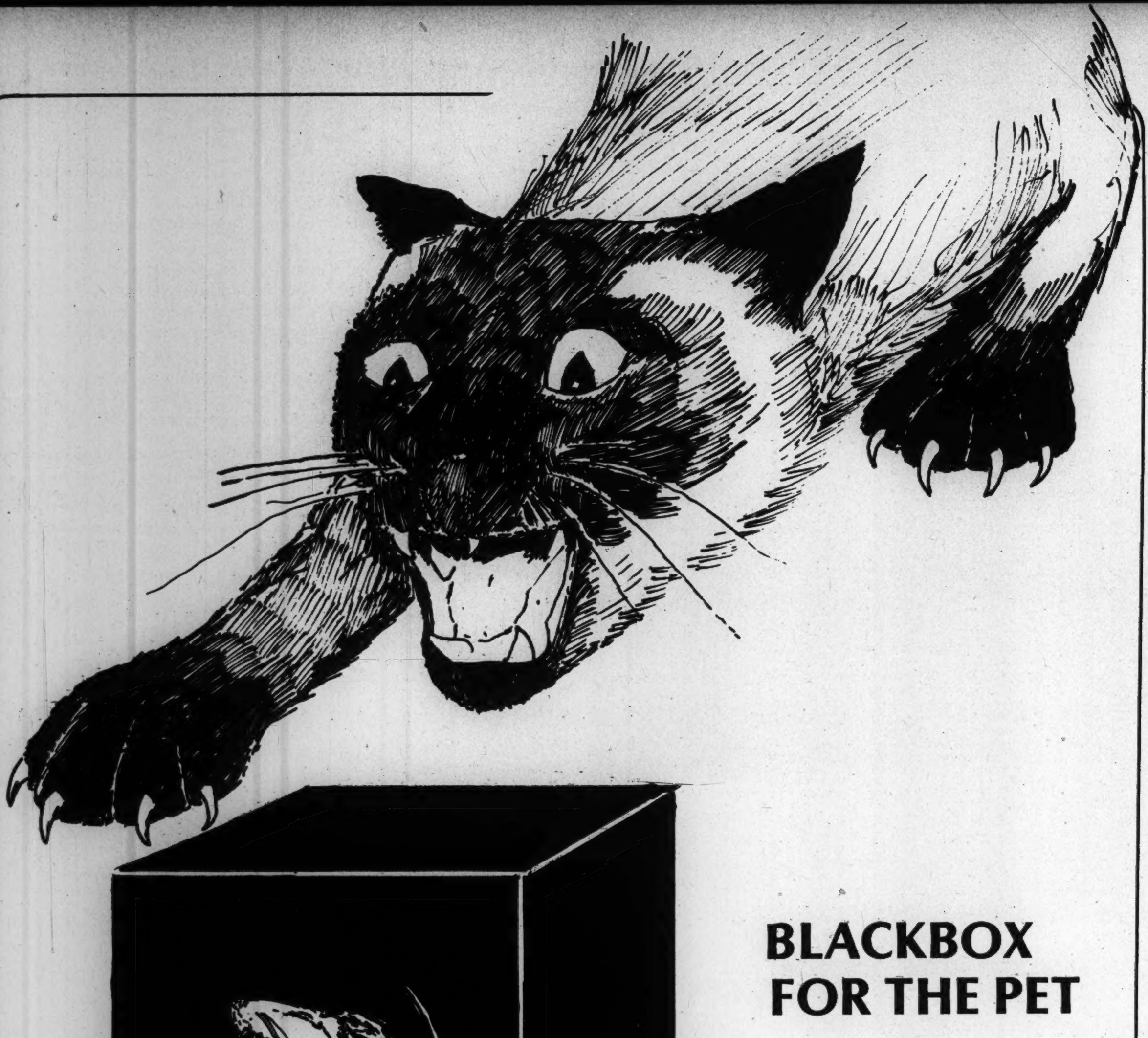

BLACKBOX FOR THE PET

Mark Zimmerman

*In November 1977, **Creative Computing** sponsored a contest to write a computer version of Black Box. The winning entry (in Microsoft Basic) was submitted by Jeff Kenton and appeared in the May/June 1978 issue. Now Mark Zimmerman has gone one step further by adding scoring and graphics in this version for the PET. Those readers with other computers can convert the program, although you'll have to find some substitute graphics symbols. — DHA*

Blackbox is a fascinating new game which puts a special twist to the deductive/inductive logic features of Invicta's **Mastermind**, and it stands a good chance to become as popular. I've written a program for a human to play Blackbox, using the 8K Commodore PET microcomputer system. The program is fairly large (almost 7K) but is written in "structured" form including extensive comments, and so it's not hard to read and understand. It makes use of some of the graphics capabilities of the PET, but only as subroutines which should not be difficult to modify for use on other machines which can interpret BASIC. Here, I will not comment further on the program; I will only give a short outline of the rules of Blackbox for

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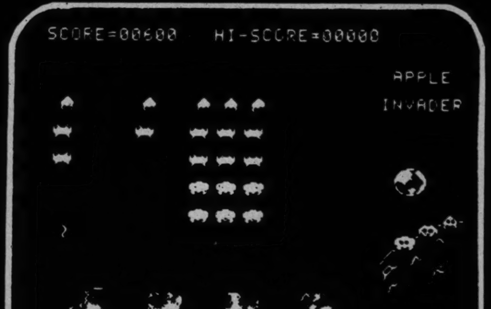

```
SCORE=00600    HI-SCORE=00000
                         APPLE
                         INVADER
                         3
```

Fifty-five aliens advance and shower you with lethal writhing electric worms. As you pick off the aliens, one-by-one, they quicken their descent. They whiz across the screen wearing away your parapets, your only defense, coming closer and closer to your level. **Super Invader** is the **original** invader game, with original moon creatures and action twice as fast as any other invader game on the market.

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Blackbox, cont'd...

readers who are unfamiliar with the game. (I recommend that you buy a set for more information. The original game is manufactured by Waddingtons in England. It is made and distributed by Parker Brothers in the USA.)

The Blackbox board is an 8 x 8 square array, with the perimeter edges numbered from 1 to 32. Five balls are placed on the board (randomly, by the computer, in the BLACKBOX program) but are invisible to the player. The player's goal is to deduce the position of the five balls with a minimum amount of information.

The player derives information by "probing" the board. He or she chooses one of the 32 perimeter edges and "sends in a probe" from that edge. A probe may be either absorbed by something it encounters within the board, or it may emerge from the board at one of the perimeter edges.

The precise rules for now probes move within the board are quite simple and logical. They are:

1. A probe moves in a straight line (like a chess rook) unless it comes within one square of a hidden ball.
2. A probe which runs directly into a ball is absorbed.
3. When a probe encounters a ball in the probe's left-front square, the probe is deflected 90° to the right; when a probe encounters a ball in its right-front square, it is deflected 90° to the left.
4. A probe which is deflected before it gets onto the board is reflected back onto the edge which the probe was entering from.
5. A probe which encounters balls in both its right-front and left-front squares is reflected; it reverses its motion (180°).

The examples shown in figures 1 and 2 should make these rules clear. Note that absorption dominates over reflection/deflection; a ball which would be both absorbed (rule 2) and deflected or reflected (rules 3-5) is absorbed.

If the player could see the path that the probe follows within the 8 x 8 board, it would be trivial for him or her to determine where the five balls are hidden. But the player isn't allowed to watch! All the information that the player is given is the edge which the probe emerges from, or the fact that the probe was absorbed somewhere within the board. A probe which apparently flies straight through the board may actually have been deflected several times along its way! This lack of complete information about what went on within the board is the reason that the game is called "Blackbox."

To play, using the BLACKBOX program, the player RUNs it to initialize variables and place the five balls randomly within the array. The player then enters any edge number, from 1 to 32. The computer sends in a probe from that edge, and reports the result in symbolic form. A "checkerboard" graphics symbol is used to replace the edge number if the probe was absorbed; a "diamond" symbol indicates that the probe was reflected back out the same edge that it was sent in (mnemonic: diamonds reflect light); and if the probe emerges at a different edge, the same graphics symbol is placed over the edge numbers of both the input and the output edges. (The Blackbox deflection rules have been designed so that a probe's motion is "time-reversable" —that is, if a probe travels from edge number 2 to exit at edge number 18, then a probe sent in at edge 18 must exit at edge number 2).

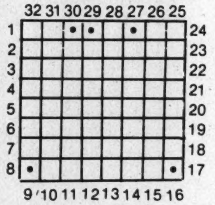
The player can, at any time, put guesses into the computer as to where one or more of the balls are hidden. For convenience in playing the game, the player's guesses are displayed on the screen, whether they are correct or not. Guesses are entered by typing the column-row coordinates of where a ball is believed to be: columns are lettered from A to H, and rows are numbered by the left-hand edge numbers, 1 to 8. (So, it's a lot like algebraic chess notation; after playing a few games, the coordinates become instinctive and the labels along the edges are hardly necessary.) If a guess needs to be changed, typing the erroneous ball's coordinates in again removes it.

When the player is satisfied that his or her guesses about the hidden balls' positions are complete and correct, the player types "Q" to quit probing and end that game. The computer then displays the actual position of the balls and adds up the player's score. As in **Mastermind**, the object is to deduce the hidden information in a minimum number of guesses. For each ball that the player fails to guess correctly, there is a penalty of five points, and for each symbol which appears around the edge of the board, the penalty is one point. The computer keeps a running total of the games played in each session and displays the player's average point score. (My average is usually about 17, but I'm not very good.) If you quit without making any guesses, you get all five balls wrong (25 points) but are not charged for any information received (symbols around board edges); if you're psychic and can guess the ball's locations without asking any questions, you might achieve a perfect score of zero!

As set up at present, the BLACKBOX program takes up to a second to calculate the path of a probe through the board. Omitting many of the REMark statements and making the program more efficient might speed up this response time, but at the cost of making the program very hard to read and understand. If the fact that some responses take longer than others bothers you (it gives a clue about how far a probe travels before absorption or emergence), you can easily add a time delay (using the computer's internal clock). I haven't bothered to.

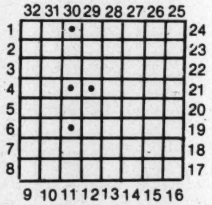
BLACKBOX is a fascinating game—try it! □

Figure 1



Sample "Blackbox" position. Balls are marked as "•" symbols. A probe sent in at edge 5 is **reflected** back out that same edge. A probe from 13 is **absorbed**; a probe from 12 is **deflected** to emerge at edge 18. A probe sent in at 2 is deflected twice to exit at 3; a probe from 23 is deflected to its doom, absorption in the middle of the board. (None of these paths are visible to the player.)

Figure 2



Another "Blackbox•" internal configuration, illustrating rules for probes' motions. A probe sent in at 2 is deflected four times to emerge apparently undeflected at 23. Probes sent in at 1, 8, 9, 11, 12, 14, 16, 17, 24, 27, 29, and 30 (for example) are **absorbed**; probes from 7, 10, 15, 18, 26, 28, and 31 (for example) are **reflected**, since they would have been deflected before getting onto the board. A probe at 20 simply emerges at 5.

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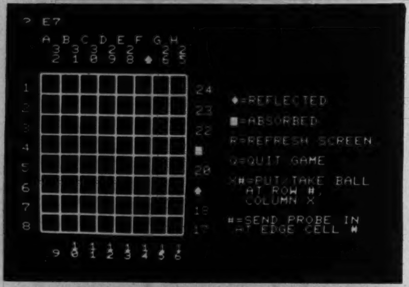
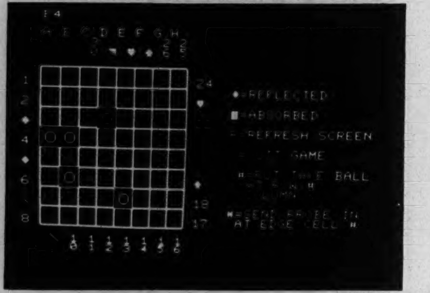
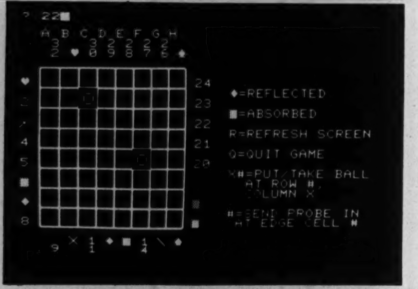
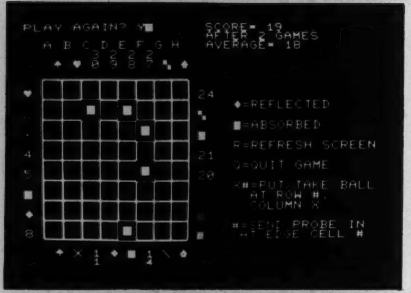

? E7
A B C D E F G H
♦=REFLECTED
■=ABSORBED
R=REFRESH SCREEN
Q=QUIT GAME
X#=PUT/TAKE BALL AT ROW #, COLUMN X
#=SEND PROBE IN AT EDGE CELL #

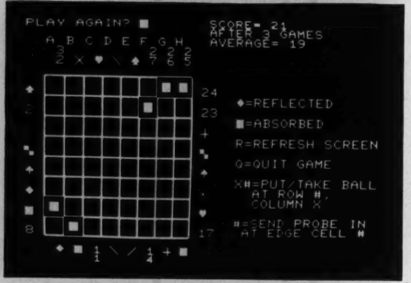

E4
A B C D E F G H
♦=REFLECTED
■=ABSORBED
R=REFRESH SCREEN
Q=QUIT GAME
X#=PUT/TAKE BALL AT ROW #, COLUMN X
#=SEND PROBE IN AT EDGE CELL #


? 22■
A B C D E F G H
♦=REFLECTED
■=ABSORBED
R=REFRESH SCREEN
Q=QUIT GAME
X#=PUT/TAKE BALL AT ROW #, COLUMN X
#=SEND PROBE IN AT EDGE CELL #



```
PLAY AGAIN? Y■          SCORE= 19
                        AFTER 2 GAMES
                        AVERAGE= 18
```

A B C D E F G H
♦=REFLECTED
■=ABSORBED
R=REFRESH SCREEN
Q=QUIT GAME
X#=PUT/TAKE BALL AT ROW #, COLUMN X
#=SEND PROBE IN AT EDGE CELL #



```
PLAY AGAIN? ■           SCORE= 21
                        AFTER 3 GAMES
                        AVERAGE= 19
```

A B C D E F G H
♦=REFLECTED
■=ABSORBED
R=REFRESH SCREEN
Q=QUIT GAME
X#=PUT/TAKE BALL AT ROW #, COLUMN X
#=SEND PROBE IN AT EDGE CELL #

```
1 DEF FNS(I)=33010+80*I+2*J:REM POINT TO SCREEN ADDRESS
10 REM BLACK BOX BY ZIMMERMANN, 1978
20 DIM B(7,7),G(4,1),M(31,1)
40 SY$="♠\●×♠π/+♥▼⁑、|─ˋ/o":BL$="                    "
60 INPUT "INSTRUCTIONS?";A$:IF LEFT$(A$,1)="Y" THEN GOSUB 9000
100 FOR K=0 TO 4:G(K,0)=-1:NEXT K:SY=0
140 GOSUB 1000:REM PRINTBOARD
180 GOSUB 2000:REM FILLBOARD
200 PRINT "▦";BL$;"▦";:INPUT A$:PRINT BL$;"▦"
260 IF A$="R" THEN PRINT "▦";:GOSUB 3000:GOTO 200:REM REFRESH
300 IF (VAL(A$)>0) AND (VAL(A$)<33) THEN GOSUB 4000:GOTO 200:REM MOVE
340 IF A$="Q" GOTO 600:REM SCORE
380 A=ASC(LEFT$(A$,1)):B=VAL(RIGHT$(A$,1))
420 IF (A>64) AND (A<73) AND (B>0) AND (B<9) THEN GOSUB 7000:GOTO 200:REM BALL
460 PRINT "HUH?":GOTO 200
600 SC=N:GA=GA+1:IF N=0 GOTO 680
620 FOR K=0 TO N-1:IF (M(K,1)>0) AND (M(K,0)<>M(K,1)) THEN SC=SC+1
640 NEXT K
680 FOR K=0 TO 4:IF G(K,0)=-1 THEN SC=SC+5:GOTO 800
720 IF 1<>(B(G(K,0),G(K,1))) THEN SC=SC+5
800 NEXT K:TT=TT+SC
840 PRINT "▦";TAB(20);"SCORE=";SC:PRINT TAB(20);"AFTER";GA;"GAMES"
880 PRINT TAB(20);"AVERAGE=";TT/GA
900 FOR I=0 TO 7:FOR J=0 TO 7
910 IF B(I,J)THEN X=FNS(I):POKE X,108:POKE X+1,123:POKE X+40,124:POKE X+41,126
920 B(I,J)=0:NEXT J:NEXT I:INPUT "▦PLAY AGAIN";A$
940 IF LEFT$(A$,1)<>"Y" THEN END
960 N=0:GOTO 100
1000 REM PRINTBOARD
1050 PRINT "▦▦▦   A B C D E F G H
1070 PRINT "   3 3 3 2 2 2 2 2
1090 PRINT "   2 1 0 9 8 7 6 5":PRINT "    ────────────────
1110 PRINT "  ┌┬┬┬┬┬┬┬┐
1130 PRINT "1 └┴┴┴┴┴┴┴┘ 24
1150 PRINT "  ┌┬┬┬┬┬┬┬┐          ♦=REFLECTED
1170 PRINT "2 └┴┴┴┴┴┴┴┘ 23
1190 PRINT "  ┌┬┬┬┬┬┬┬┐          ▒=ABSORBED
1210 PRINT "3 └┴┴┴┴┴┴┴┘ 22
1230 PRINT "  ┌┬┬┬┬┬┬┬┐          R=REFRESH SCREEN
1250 PRINT "4 └┴┴┴┴┴┴┴┘ 21
1270 PRINT "  ┌┬┬┬┬┬┬┬┐          Q=QUIT GAME
1290 PRINT "5 └┴┴┴┴┴┴┴┘ 20
1310 PRINT "  ┌┬┬┬┬┬┬┬┐          X#=PUT/TAKE BALL
1330 PRINT "6 └┴┴┴┴┴┴┴┘ 19         AT ROW #,
1350 PRINT "  ┌┬┬┬┬┬┬┬┐            COLUMN X
1370 PRINT "7 └┴┴┴┴┴┴┴┘ 18
1390 PRINT "  ┌┬┬┬┬┬┬┬┐          #=SEND PROBE IN
1410 PRINT "8 └┴┴┴┴┴┴┴┘ 17        AT EDGE CELL #":PRINT "    ────────────────
1430 PRINT "     1 1 1 1 1 1 1
1450 PRINT "   9 0 1 2 3 4 5 6▦":RETURN
2000 REM FILLBOARD
2040 Z=RND(-TI):REM RANDOMIZE
2080 FOR K=0 TO 4
2120 I=INT(8*RND(1)):J=INT(8*RND(1))
2160 IF B(I,J) GOTO 2120
2200 B(I,J)=1:NEXT K:RETURN
3000 REM REFRESH SCREEN
3040 GOSUB 1000:SY=0:REM PRINTBOARD & RESET SYMBOL COUNTER
3080 IF N=0 GOTO 3200:REM SKIP IF NO MOVES
3120 FOR K=0 TO N-1:ID=M(K,0):OD=M(K,1):GOSUB 6000:NEXT K:REM SHOW MOVES
3200 FOR K=0 TO 4:I=G(K,0):IF I=-1 GOTO3400:REM SKIF IF BALL NOT OUT
3240 J=G(K,1):X=FNS(I):POKE X,85:POKE X+1,73:POKE X+40,74:POKE X+41,75
3400 NEXT K:RETURN
4000 REM MOVE
4040 V=INT((VAL(A$)+7)/8):ON V GOSUB 4900,4920,4940,4960:REM GET X,Y FOR MOVE
4080 M(N,0)=VAL(A$)
4100 GOSUB 5500:REM FIND L,C,R (WHICH BALL WILL ENCOUNTER)
4140 IF C THEN V=0:GOTO 5000:REM ABSORBED
4160 IF L OR R GOTO 4440:REM REFLECTED ON WAY IN
4190 ON V GOSUB 5420,5440,5460,5480:REM MOVE IT ONTO BOARD
4200 GOSUB 5500:REM GET L,C,R
4220 IF C THEN V=0:GOTO 5000:REM ABSORBED
4240 IF L AND R THEN GOSUB 5100:GOTO 4300:REM REFLECTED
4260 IF L THEN GOSUB 5200:GOTO 4300:REM BOUNCE RIGHT
4280 IF R THEN GOSUB 5300:REM BOUNCE LEFT
4300 GOSUB 4700:IF Q GOTO 4500:REM QUIT IF HEADING OFF BOARD
4340 ON V GOSUB 5420,5440,5460,5480:REM MOVE IT!
4380 GOSUB 4700:IF Q GOTO 4500:REM QUIT IF GOING OFF NOW TOO
4400 GOTO 4200:REM MOVE AGAIN....
4440 V=V-2:IF V<1 THEN V=V+4
4500 IF V=2 THEN M(N,1)=32-Y:GOTO 4600
4520 IF V=3 THEN M(N,1)=X+1:GOTO 4600
4540 IF V=4 THEN M(N,1)=Y+9:GOTO 4600
4560 IF V=1 THEN M(N,1)=24-X
4600 ID=M(N,0):OD=M(N,1):GOSUB 6000:N=N+1:RETURN:REM MOVE MADE & RECORDED!
4700 Q=((X=0) AND (V=2)) OR ((Y=0) AND (V=3))
4720 Q=Q OR ((X=7) AND (V=4)) OR ((Y=7) AND (V=1))
4740 RETURN:REM Q IF GOING OFF BOARD
4880 REM 4900-4960 ARE SUBS TO MAKE X,Y FOR MOVE
4900 X=VAL(A$)-1:Y=-1:RETURN
4920 X=8:Y=VAL(A$)-9:RETURN
4940 X=24-VAL(A$):Y=8:RETURN
4960 X=-1:Y=32-VAL(A$):RETURN
```

Blackbox, cont'd...

```
5000 REM ABSORBED
5020 M(N,1)=0:OD=0:ID=M(N,0):GOSUB 6000:N=N+1:RETURN
5100 REM REFLECT
5120 V=V+2:IF V>4 THEN V=V-4
5140 RETURN
5200 REM BOUNCE RIGHT
5220 V=V-1:IF V=0 THEN V=4
5240 RETURN
5300 REM BOUNCE LEFT
5320 V=V+1:IF V=5 THEN V=1
5340 RETURN
5400 REM 5420-5480 MOVE BALL
5420 Y=Y+1:RETURN
5440 X=X-1:RETURN
5460 Y=Y-1:RETURN
5480 X=X+1:RETURN
5500 REM L,C,R SUB
5520 ON V GOTO 5600,5700,5800,5900
5600 C=B(X,Y+1):IF X=0 THEN L=0:GOTO 5640
5620 L=B(X-1,Y+1)
5640 IF X=7 THEN R=0:RETURN
5660 R=B(X+1,Y+1):RETURN
5700 C=B(X-1,Y):IF Y=0 THEN L=0:GOTO 5740
5720 L=B(X-1,Y-1)
5740 IF Y=7 THEN R=0:RETURN
5760 R=B(X-1,Y+1):RETURN
5800 C=B(X,Y-1):IF X=7 THEN L=0:GOTO 5840
5820 L=B(X+1,Y-1)
5840 IF X=0 THEN R=0:RETURN
5860 R=B(X-1,Y-1):RETURN
5900 C=B(X+1,Y):IF Y=7 THEN L=0:GOTO 5940
5920 L=B(X+1,Y+1)
5940 IF Y=0 THEN R=0:RETURN
5960 R=B(X+1,Y-1):RETURN
6000 REM PUT SYMBOLS DOWN GIVEN ID,OD,SY
6040 IF OD<>0 GOTO 6100
6080 AD=ID:GOSUB 6600:POKE P1,32:POKE P2,102
       RETURN:REM ABSORBED
6100 IF OD<>ID GOTO 6200
6140 AD=ID:GOSUB 6600:POKE P1,32:POKE P2,90:
       RETURN:REM REFLECTED
6200 AD=ID:GOSUB 6600:SY=SY+1:S=ASC(MID$(SY$,SY,1))-128
6240 POKE P1,32:POKE P2,S
6280 AD=OD:GOSUB 6600:POKE P1,32:POKE P2,S:RETURN:
       REM SAME SYMBOL BOTH PLACES
6600 REM LOCATE CAPTION COORDINATES GIVEN AD=1 TO 32
6640 ON (INT(AD+7)/8) GOTO 6700,6740,6780,6820
6680 STOP:REM ERROR TRAP
6700 P1=32967+80*AD:P2=P1+1:RETURN
6740 P1=33713+2*AD:P2=P1-40:RETURN
6780 P1=34988-80*AD:P2=P1-1:RETURN
6820 P1=32955-2*AD:P2=P1+40:RETURN
7000 REM PUT BALL DOWN OR PICK UP
7040 J=A-65:I=B-1:Q=0
7080 FOR K=0 TO 4
7120 IF (G(K,0)<>I)OR(G(K,1)<>J) GOTO 7160
7140 X=FNS(I):POKE X,79:POKE X+1,80:POKE X+40,76:
       POKE X+41,122
7150 Q=1:G(K,0)=-1:K=4
7160 NEXT K:IF Q THEN RETURN:REM REMOVED A BALL
7200 FOR K=0 TO 4
7240 IF G(K,0)<>-1 GOTO 7280
7260 X=FNS(I):POKE X,85:POKE X+1,73:POKE X+40,74:POKE X+41,75
7270 G(K,0)=I:G(K,1)=J:K=4:Q=1
7280 NEXT K:IF Q THEN RETURN:REM PLACED A BALL
7320 PRINT "LIST FULL, SORRY":RETURN
9000 REM INSTRUCTIONS
9040 PRINT "]I WILL HIDE 5 BALLS WITHIN AN 8X8 BOX;
9060 PRINT "YOU MUST DEDUCE THEIR LOCATIONS BY
9080 PRINT "PROBING FROM THE SIDES.  TYPE A NUMBER
9100 PRINT "TO SEND IN A PROBE.  IF THE PROBE HITS
9120 PRINT "A BALL HEAD-ON, IT IS ABSORBED; IF IT
9140 PRINT "HITS A GLANCING BLOW, IT IS DEFLECTED
9160 PRINT "90 DEGREES; TWO DEFLECTIONS OR A
9180 PRINT "DEFLECTION BEFORE GETTING ON THE BOARD
9200 PRINT "MAKE A REFLECTION.
9220 PRINT "I MARK ABSORPTIONS BY ※, REFLECTIONS
9240 PRINT "BY ◆, AND DEFLECTIONS BY PUTTING THE
9460 PRINT "SAME SYMBOL BY BOTH INPUT & OUTPUT
9480 PRINT "CELLS.  ALL THIS WILL BECOME CLEARER
9500 PRINT "WITH SOME SAMPLE GAMES.
9520 PRINT "TYPE A LETTER-NUMBER PAIR TO PLACE A
9540 PRINT "BALL ON THE SCREEN (EXAMPLES:  A1, G4,
9560 PRINT "H7, ETC.).  TYPE R TO REFRESH THE
9600 PRINT "SCREEN DISPLAY, AND Q TO QUIT GUESSING
9620 PRINT "AND SEE THE ACTUAL SET-UP AND YOUR
9640 PRINT "SCORE.  YOU GET 5 POINTS FOR EACH BALL
9660 PRINT "THAT YOU MISSED GUESSING, AND 1 POINT
9680 PRINT "FOR EACH SYMBOL YOU GOT AROUND THE EDGE
9700 PRINT "OF THE SCREEN; TRY TO MINIMIZE YOUR
9740 PRINT "SCORE.  GOOD LUCK!  HIT A KEY TO PLAY":A$=""
9760 GET A$:IF A$="" GOTO 9760
9780 RETURN
```

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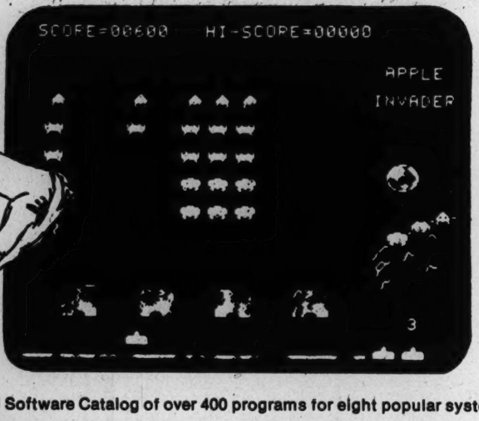

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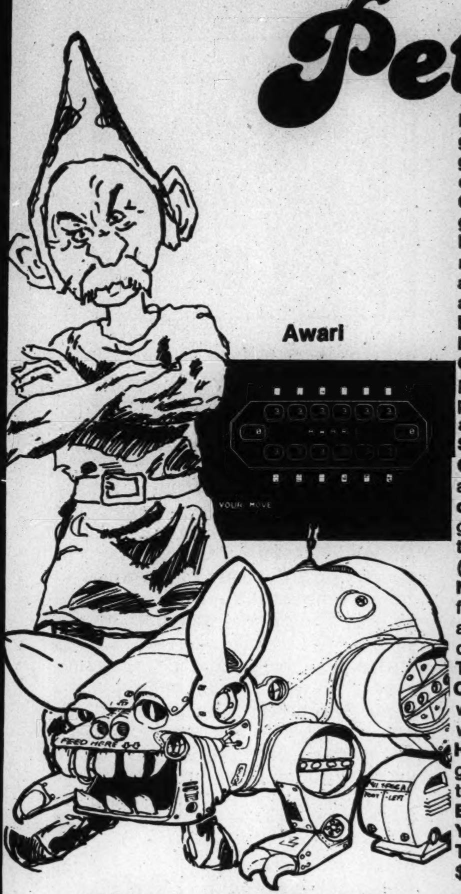
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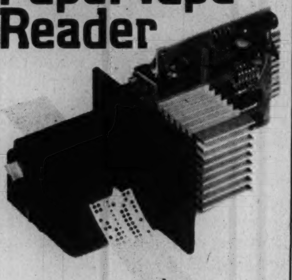

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Music Composition by Analysis

Jack Wilson

The power of the computer has been applied to music composition and synthesis for many years. However, most of the accomplishments have been locked away in the studios of universities. Now, in the dawning age of the microcomputer, the thrill of creating real music can be felt by anyone.

Creative Computing has made a real contribution to musical research on the home computer by publishing articles pertaining to composition. I call your attention to "Music Composition: A New Technique," Feb., 1979 and to "Music Composition: A Different Approach," Apr., 1979.

The program presented here differs from the above programs in that it is not based on controlled randomness. The program performs an analysis of an existing composition, extrapolates the patterns of notes, and creates a new composition based on these patterns. It establishes the patterns by determining what notes can follow any given note and the relative probability of each of the possible following notes. If your favorite composer never followed a C# in the third octave with a C# in the second octave then the piece created by the computer after analysis won't do that either.

The program was written on a Heathkit H8 computer with 24K of memory and a disk operating system. The program is in two parts. Listing 1 is the part of the program that will build a file on disk composed of numbers representing notes of a single voice of the composition to be analyzed. This file could be built in memory if sufficient space is available. Durations of the notes are ignored but could be a subject for further study. Listing 2 is the analysis part of the program.

Any number scheme can be used. The scheme I used was to assign the numbers 1 through 12 to the twelve semitones in the highest octave starting with "C." Each succeeding lower octave is represented by adding 16 to the same note in the next higher octave. (Notes 13 thru 16 are rests.)

The program performs a two pass analysis of the composition under study and builds a three dimensional array representing all two note combinations. The first pass simply creates a list of all the notes used and stores the list in the first dimension of the array. The second pass lists, in the second dimension of the array, all possible notes that could follow the note in the first dimension of the array. The second pass also stores the frequency of occurence in the first element of the third dimension of the array. The program then determines the probability of occurence and stores this in the second element of the third dimension of the array.

This array, essentially a probability chart, can be printed for study and for confirmation that the program is functioning properly.

Finally the program will apply the data in the probability chart to create a new composition of any length. This composition can be printed and played on any instrument. I am fortunate in that I can let the computer play it back for me on a custom designed synthesizer interface to the computer.

The music created in this way will never make the top forty but it is pleasant to hear. I find it much better music than any created by controlled randomness. If Bach is the composer analyzed then the resulting composition is definitely "Bach-like." The essential problem is that the music seems to ramble, never building to a climax.

Using this program as a stepping stone, the possibilities for new music composition programs seem endless. The experimenter could use the resulting composition and subject it to analysis for second or third generation compositions. An occasional random jump could be incorporated. Programs could be written to combine 1/F correlation to develop music with more surprises. Music composition by computer has unlimited potential for further study. ☐

Jack Wilson, 2648 Goddard, Toledo, OH 43606.

Composition, cont'd...

```
 LIST
00001 REM THIS PROGRAM BUILDS A FILE OF NUMBERS REPRESENTING A SONG.
00003 DIM R$(12)
00005 R$(0)="R": R$(1)="C": R$(2)="CS": R$(3)="D": R$(4)="DS"
00006 R$(5)="E": R$(6)="F": R$(7)="FS": R$(8)="G": R$(9)="GS"
00007 R$(10)="A": R$(11)="AS": R$(12)="B"
00020 INPUT "NAME OF SONG TO BE ENTERED? ";A$
00030 OPEN A$ FOR WRITE AS FILE #1
00040 PRINT "ENTER EACH NOTE AS THE LETTER OF THE NOTE. C SHARP = 'CS'."
00050 PRINT "G FLAT = 'FS'. REST = 'R'. A = 'A'.ETC"
00060 PRINT "THE TOP MOST OCTAVE IS '1'. THE LOWEST OCTAVE IS '8'."
00065 PRINT "A REST MUST ALWAYS BE IN THE TOP OCTAVE (1)."
00070 PRINT "WHEN THE LAST NOTE IS ENTERED SAY 'Z' FOR THE NOTE."
00080 B=1
00090 PRINT "NOTE ";B;" = ";:INPUT ;C$
00095 IF C$="Z" THEN GOTO 160
00100 PRINT "      OCTAVE = ";:INPUT D
00110 FOR E=0 TO 12: IF R$(E)=C$ THEN GOTO 130
00115 NEXT E
00120 PRINT "INVALID NOTE NAME. ": GOTO 90
00130 FOR F=0 TO D:E=E+16:NEXT F
00140 E=E-16: PRINT #1,E: B=B+1
00150 GOTO 90
00160 CLOSE #1
*
```

Listing 1

```
 RUN
NAME OF SONG TO BE ENTERED? INDIA
ENTER EACH NOTE AS THE LETTER OF THE NOTE. C SHARP = 'CS'.
G FLAT = 'FS'. REST = 'R'. A = 'A'.ETC
THE TOP MOST OCTAVE IS '1'. THE LOWEST OCTAVE IS '8'.
A REST MUST ALWAYS BE IN THE TOP OCTAVE (1).
WHEN THE LAST NOTE IS ENTERED SAY 'Z' FOR THE NOTE.
NOTE  1  = ? A
     OCTAVE = ? 4
NOTE  2  = ? A
     OCTAVE = ? 4
NOTE  3  = ? A
     OCTAVE = ? 4
NOTE  4  = ? C
     OCTAVE = ? 3
NOTE  5  = ? D
     OCTAVE = ? 3
NOTE  6  = ? A
     OCTAVE = ? 4
NOTE  7  = ? C
     OCTAVE = ? 3
NOTE  8  = ? D
     OCTAVE = ? 3
NOTE  9  = ? E
     OCTAVE = ? 3
NOTE  10  = ? C
     OCTAVE = ? 3
NOTE  11  = ? R
     OCTAVE = ? 1
NOTE  12  = ? E
     OCTAVE = ? 4
NOTE  13  = ? G
     OCTAVE = ? 4
NOTE  14  = ? A
     OCTAVE = ? 4
NOTE  15  = ? E
     OCTAVE = ? 4
NOTE  16  = ? G
     OCTAVE = ? 4
NOTE  17  = ? A
     OCTAVE = ? 4
NOTE  18  = ? G
     OCTAVE = ? 4
NOTE  19  = ? G
     OCTAVE = ? 4
NOTE  20  = ? G
     OCTAVE = ? 4
NOTE  21  = ? R
     OCTAVE = ? 1
NOTE  22  = ? R
     OCTAVE = ? 1
NOTE  23  = ? B
     OCTAVE = ? 2
NOTE  24  = ? D
     OCTAVE = ? 1
NOTE  25  = ? B
     OCTAVE = ? 2
NOTE  26  = ? B
     OCTAVE = ? 2
NOTE  27  = ? A
     OCTAVE = ? 2
NOTE  28  = ? A
     OCTAVE = ? 2
NOTE  29  = ? G
     OCTAVE = ? 2
NOTE  30  = ? Z
END AT LINE  65535
*
```

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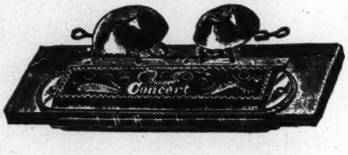
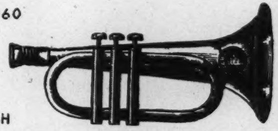
Composition, cont'd...



```
 LIST
00009 DIM F$(12)
00010 DIM N(30,20,2)
00012 F$(0)='R ':F$(1)='C ':F$(2)='C#':F$(3)='D '
00014 F$(4)='D#':F$(5)='E ':F$(6)='F ':F$(7)='F#'
00016 F$(8)='G ':F$(9)='G#':F$(10)='A ':F$(11)='A#':F$(12)='B '
00020 INPUT 'NAME OF SONG FOR ANALYSIS?: ';A$
00025 INPUT 'SHALL I PRINT THE VOICE? ';B$
00026 IF B$='Y' THEN GOTO 2000
00030 INPUT 'HOW MANY NOTES OF THIS SONG SHALL I ANALYZE?: ';C
00040 L=C:OPEN A$ FOR READ AS FILE #1
00050 INPUT #1,;D
00060 FOR B=0 TO 30:IF N(B,0,0)=D THEN GOTO 90
00070 IF N(B,0,0)=0 THEN GOTO 100
00080 NEXT B
00090 N(B,0,1)=N(B,0,1)+1:GOTO 110
00100 N(B,0,0)=D:N(B,0,1)=1
00110 C=C-1:IF C=0 THEN GOTO 130
00120 GOTO 50
00130 PRINT 'PASS #1 COMPLETE. ALL NOTES BUILT IN N(B,0,0).'
00140 CLOSE #1
00150 OPEN A$ FOR READ AS FILE #1:INPUT #1,;D
00160 FOR B=0 TO 25
00170 IF N(B,0,0)=D THEN GOTO 190
00180 NEXT B
00185 PRINT 'ERROR - NOTE NOT FOUND.'
00190 INPUT #1,;D
00200 FOR E=1 TO 20:IF N(B,E,0)=D THEN GOTO 230
00210 IF N(B,E,0)=0 THEN GOTO 250
00220 NEXT E
00230 N(B,E,1)=N(B,E,1)+1:GOTO 260
00250 N(B,E,0)=D:N(B,E,1)=1
00260 L=L-1:IF L=0 THEN GOTO 280
00270 GOTO 160
00280 PRINT 'PASS #2 COMPLETE. ONE DEEP ANALYSIS DONE.'
00300 FOR B=0 TO 30
00310 FOR E=1 TO 20
00320 A=N(B,E,1)+A
00330 NEXT E
00340 FOR E=1 TO 20:IF N(B,E,1)=0 THEN GOTO 360
00350 N(B,E,2)=INT((N(B,E,1)/A)*100)
00360 NEXT E
00365 A=0
00370 NEXT B
00380 CLOSE #1
00390 PRINT 'PROBABILITY CALCULATIONS COMPLETE. I AM PREPARED TO COMPOSE.'
00395 INPUT 'SHALL I PRINT PROBABILITY MAP?(Y,N): ';A$
00396 IF A$='Y' THEN GOTO 1000
00400 INPUT 'PLEASE SEED WITH FIRST NOTE IN NUMBER FORMAT IE(58):';A
00410 INPUT 'HOW MANY NOTES SHALL I COMPOSE?: ';Z
00415 K=1
00420 INPUT 'WHAT SHALL I CALL THIS MASTERPIECE? ';A$
00430 OPEN A$ FOR WRITE AS FILE #1
00440 FOR D=0 TO 30:IF N(D,0,0)=A THEN GOTO 460
00450 NEXT D
00455 INPUT 'SEED DIDN'T GERMINATE. TRY AGAIN. ';A:GOTO 440
00460 FOR E=1 TO 20
00470 F=INT(RND(1)*100)
00480 IF N(D,E,0)=0 THEN GOTO 510
00490 IF N(D,E,2)>F THEN GOTO 520
00500 NEXT E
00501 IF G=0 THEN GOTO 500
00510 GOTO 460
00520 PRINT #1,N(D,E,0)
00540 K=K+1
00550 IF K=Z THEN GOTO 600
00560 A=N(D,E,0)
00570 GOTO 440
00600 CLOSE #1
00610 INPUT 'WANT TO PRINT NEW SONG? ';O$
00620 IF O$='Y' THEN GOTO 4000
01000 K=1
01020 FOR B=0 TO 30:N=N(B,0,0)
01030 FOR C=0 TO 8:N=N-16:IF N<0 THEN GOTO 1050
01040 K=K+1:NEXT C
01050 N=N+16
01060 PRINT F$(N);K;' (';N(B,0,0);')',N(B,0,1)
01070 FOR E= 1 TO 20:IF N(B,E,0)=0 THEN GOTO 1140
01080 K=1:N=N(B,E,0)
01090 FOR C=0 TO 8:N=N-16
01100 IF N<0 THEN GOTO 1120
01110 K=K+1:NEXT C
01120 N=N+16
01130 PRINT '        ';F$(N);K;' (';N(B,E,0);')',N(B,E,1),N(B,E,2)
01140 NEXT E
01150 PRINT :NEXT B
```

Composition, cont'd...

```
01160 GOTO 400
02000 INPUT 'HOW MANY NOTES SHALL I PRINT? ';H
02010 OPEN A$ FOR READ AS FILE #1
02015 INPUT #1,;D
02020 H=H-1:IF H=0 THEN GOTO 2080
02030 E=D:K=1
02040 FOR C=0 TO 8:E=E-16:IF E<0 THEN GOTO 2060
02050 K=K+1:NEXT C
02060 E=E+16:PRINT F$(E);K,D
02070 GOTO 2015
00280 PRINT 'PASS #2 COMPLETE. ONE DEEP ANALYSIS DONE.
00300 FOR B=0 TO 30
00310 FOR E=1 TO 20
00320 A=N(B,E,1)+A
00330 NEXT E
00340 FOR E=1 TO 20:IF N(B,E,1)=0 THEN GOTO 360
00350 N(B,E,2)=INT((N(B,E,1)/A)*100)
00360 NEXT E
00365 A=0
00370 NEXT B
00380 CLOSE #1
00390 PRINT 'PROBABILITY CALCULATIONS COMPLETE. I AM PREPARED TO COMPOSE.
00395 INPUT 'SHALL I PRINT PROBABILITY MAP?(Y,N): ';A$
00396 IF A$='Y' THEN GOTO 1000
00400 INPUT 'PLEASE SEED WITH FIRST NOTE IN NUMBER FORMAT I2(58):';A
00410 INPUT 'HOW MANY NOTES SHALL I COMPOSE?: ';Z
00415 K=1
00420 INPUT 'WHAT SHALL I CALL THIS MASTERPIECE? ';A$
00430 OPEN A$ FOR WRITE AS FILE #1
00440 FOR D=0 TO 30:IF N(D,0,0)=A THEN GOTO 460
00450 NEXT D
00455 INPUT 'SEED DIDN'T GERMINATE. TRY AGAIN. ';A:GOTO 440
00460 FOR E=1 TO 20
00470 F=INT(RND(1)*100)
00480 IF N(D,E,0)=0 THEN GOTO 510
00490 IF N(D,E,2)>F THEN GOTO 520
00500 NEXT E
00501 IF G=0 THEN GOTO 500
00510 GOTO 460
00520 PRINT #1,N(D,E,0)
00540 K=K+1
00550 IF K=Z THEN GOTO 600
00560 A=N(D,E,0)
00570 GOTO 440
00600 CLOSE #1
00610 INPUT 'WANT TO PRINT NEW SONG? ';O$
00620 IF O$='Y' THEN GOTO 4000
01000 K=1
01020 FOR B=0 TO 30:N=N(B,0,0)
01030 FOR C=0 TO 8:N=N-16:IF N<0 THEN GOTO 1050
01040 K=K+1:NEXT C
01050 N=N+16
01060 PRINT F$(N);K;' (';N(B,0,0);')',N(B,0,1)
01070 FOR E= 1 TO 20:IF N(B,E,0)=0 THEN GOTO 1140
01080 K=1:N=N(B,E,0)
01090 FOR C=0 TO 8:N=N-16
01100 IF N<0 THEN GOTO 1120
01110 K=K+1:NEXT C
01120 N=N+16
01130 PRINT '       ';F$(N);K;' (';N(B,E,0);')',N(B,E,1),N(B,E,2)
01140 NEXT E
01150 PRINT :NEXT B
01160 GOTO 400
02000 INPUT 'HOW MANY NOTES SHALL I PRINT? ';H
02010 OPEN A$ FOR READ AS FILE #1
02015 INPUT #1,;D
02020 H=H-1:IF H=0 THEN GOTO 2080
02030 E=D:K=1
02040 FOR C=0 TO 8:E=E-16:IF E<0 THEN GOTO 2060
02050 K=K+1:NEXT C
02060 E=E+16:PRINT F$(E);K,D
02070 GOTO 2015
02080 CLOSE #1:GOTO 30
04000 OPEN A$ FOR READ AS FILE #1
04010 INPUT 'HOW MANY NOTES SHALL I PRINT? ';H
04020 INPUT #1,;D
04030 E=D:K=1
04040 H=H-1:IF H=0 THEN GOTO 5000
04050 FOR C=0 TO 8:E=E-16:IF E<0 THEN GOTO 4070
04060 K=K+1:NEXT C
04070 E=E+16:PRINT F$(E);K,D
04080 GOTO 4020
05000 CLOSE #1
05010 STOP
*
```



Listing 2

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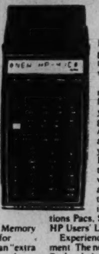

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Composition, cont'd...

```
 RUN
NAME OF SONG FOR ANALYSIS?: INDIAA
SHALL I PRINT THE VOICE? Y
HOW MANY NOTES SHALL I PRINT? 30
A  4          58
A  4          58
A  4          58
C  3          33
D  3          35
A  4          58
C  3          33
D  3          35
E  3          37
C  3          33
R  1          0
E  4          53
G  4          56
A  4          58
E  4          53
G  4          56
A  4          58
G  4          56
G  4          56
G  4          56
R  1          0
R  1          0
B  2          28
D  1          3
B  2          28
B  2          28
A  2          26
A  2          26
G  2          24
HOW MANY NOTES OF THIS SONG SHALL I ANALYZE?: 75
PASS #1 COMPLETE. ALL NOTES BUILT IN N(3,0,0).
PASS #2 COMPLETE. ONE DEEP ANALYSIS DONE.
PROBABILITY CALCULATIONS COMPLETE. I AM PREPARED TO COMPOSE.
SHALL I PRINT PROBABILITY MAP?(Y,N): Y
A  4  ( 58 )  8
      A  4  ( 58 )          3            37
      C  3  ( 33 )          2            25
      E  4  ( 53 )          1            12
      G  4  ( 56 )          2            25

C  6  ( 33 )  3
      D  3  ( 35 )          2            66

D  5  ( 35 )  3
      A  4  ( 58 )          1            33
      E  3  ( 37 )          1            33
      B  4  ( 60 )          1            33

E  6  ( 37 )  1
      C  3  ( 33 )          1            100

E  6  ( 53 )  5
      G  4  ( 56 )          3            60
      E  4  ( 53 )          1            20
      D  4  ( 51 )          1            20

G  7  ( 56 )  12
      A  4  ( 58 )          2            18
      G  4  ( 56 )          6            54
      E  4  ( 53 )          2            18
      B  4  ( 60 )          1            9

B  5  ( 28 )  6
      D  1  ( 3 )           1            16
      B  2  ( 28 )          2            33
      A  2  ( 26 )          1            16
      G  2  ( 24 )          1            16

D  2  ( 3 )   1
      B  2  ( 28 )          1            100

A  3  ( 26 )  4
      A  2  ( 26. )         1            25
      G  2  ( 24 )          2            50
      E  2  ( 21 )          1            25

G  3  ( 24 )  9
      G  2  ( 24 )          2            25
      E  2  ( 21 )          2            25
      B  2  ( 28 )          2            25
      A  2  ( 26 )          2            25
```

Composition, cont'd...

```
E  3  ( 21 )  7
         G  2  ( 24 )           3               42
         E  2  ( 21 )           2               28
         D  2  ( 19 )           1               14

D  3  ( 19 )  2
         D  2  ( 19 )           1               50
         E  2  ( 21 )           1               50

B  5  ( 60 )  4
         D  3  ( 35 )           1               25
         B  4  ( 60 )           1               25
         A  4  ( 58 )           1               25
         G  4  ( 56 )           1               25

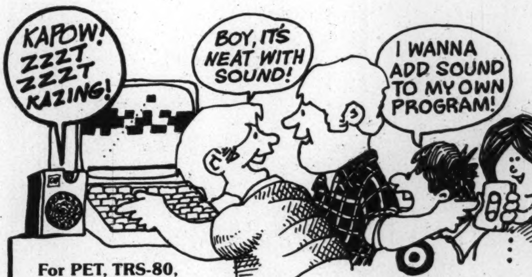
D  7  ( 51 )  1
         D  4  ( 51 )           1              100

R  4  ( 0 )   0
         E  4  ( 53 )           1               20
         B  2  ( 26 )           1               20
         G  2  ( 24 )           1               20
         E  2  ( 21 )           1               20
         B  4  ( 60 )           1               20

R  4  ( 0 )   0

R  4  ( 0 )   0
^C
! ERROR - CTL-C STRUCK AT LINE  1140
*GOTO 400
*CONTINUE
```

```
PLEASE SEED WITH FIRST NOTE IN NUMBER FORMAT IE(58):58
HOW MANY NOTES SHALL I COMPOSE?: 50
WHAT SHALL I CALL THIS MASTERPIECE? IND
WANT TO PRINT NEW SONG? Y
HOW MANY NOTES SHALL I PRINT? 30
E  4       53
G  4       56
A  4       58
A  4       58
C  3       33
D  3       35
A  4       58
A  4       58
A  4       58
A  4       58
E  4       53
G  4       56
A  4       58
E  4       53
G  4       56
G  4       56
G  4       56
A  4       58
G  4       56
G  4       56
G  4       56
G  4       56
A  4       58
A  4       58
C  3       33
D  3       35
A  4       58
A  4       58
A  4       58
STOP AT LINE  5010
*
```



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CIRCLE 126 ON READER SERVICE CARD

Pascal as a Game

Volker Raab

In Creative Computing, we often print computer games that are based on board games such as Mastermind, Black Box, Battleship, or Zone X. However, this is the opposite situation. Volker Raab in this article describes his concept of a board game based on PASCAL. It looks like it could be an interesting and challenging game, both to design as well as play. If it leads to a commercial product, obviously Mr. Raab is entitled to a share of the royalties.

The Pascal board game is quite a traditional board game with boxes, dice, playing pieces, etc. There is, however, one essential difference compared to other board games. The Pascal board game exemplifies concepts of modern programming languages, i.e. PASCAL. You may imagine that your playing piece is an instruction or, rather, statement, counter walking through a program. Whenever it's your turn, you will have to cast a die and advance the number of boxes corresponding to your die-cast. Beware! Two different kinds of boxes exist! The first kind represents simple statements, simple statements won't affect you unless you stop at a simple statement box at the end of your turn. (That's not the way a program behaves, but I can't make it a game without this rule!). When you stop at a simple statement box, naturally you do what the statement box says. What does a statement box ask you to do? There are a lot of possibilities: nothing, goto a label (some people, even Wirth, still use it), call a procedure or a function (whatever that means in this game), delay one or two turns, random (get a card from a random stack), overflow, input, output, etc.

So far nothing is really unusual. But there's still the other kind box called selection boxes. Selection boxes are used to determine what way your playing piece should go. If you take a look at Figure 1, you'll see what a selection box does. Path is just used as shorthand for a sequence of boxes, statement boxes and selection boxes. Selection boxes are represented by boxes containing a question mark? Obviously all players start at the first box, labelled begin, and eventually end at the last box, labelled end. But many roads (paths with loops and detours) lead to Rome! The question mark in the selection boxes stands for a condition. The figure itself just illustrates the general idea of the game, the game map would, of course, have to be quite a bit more elaborate. There's another important difference between selection boxes and simple statement boxes. Selection boxes affect in passing, i.e. whenever you happen to pass a selection box, you have to choose your path according to the condition for the selection box. A Pascal "for" statement may be an exception, unlike an Algol "for" statement. A representation of a Pascal "for" statement requires that the player, on entrance to the for loop, determine how many times the for loop is executed, i.e., how many times you have to walk through the loop. Figure 1 represents the main program; it might as well represent a procedure or function of the main program. A

Volker Raab, Ramtenvej 30, DK 8581 Vimtofte, Denmark.

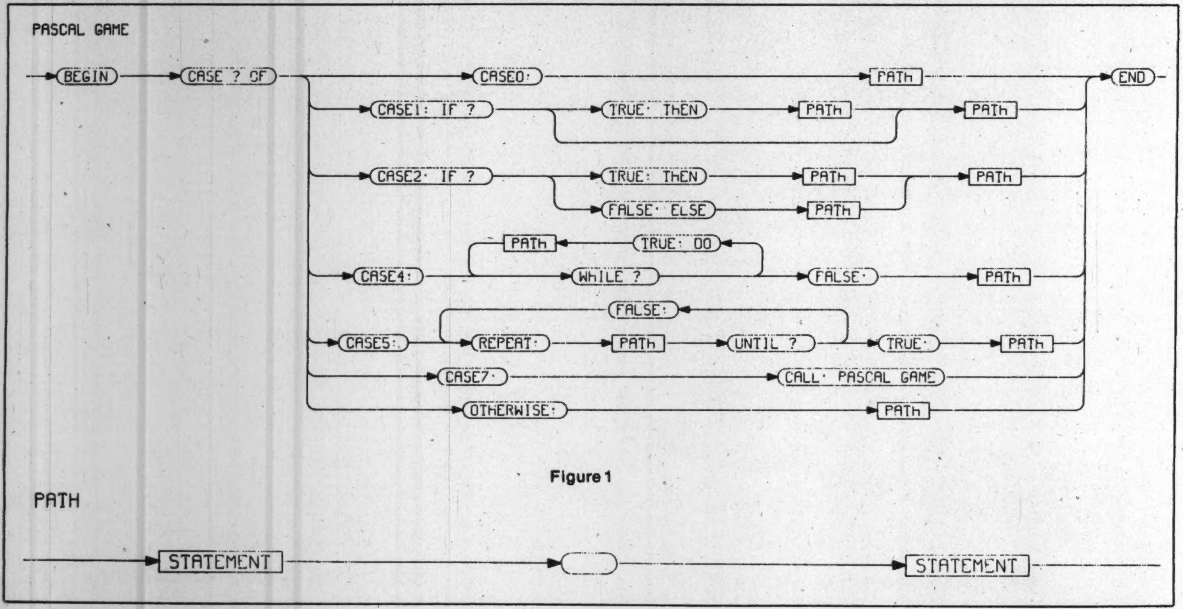

Figure 1

Pascal, cont'd...

procedure can be recursive, i.e., call itself. Figure 1, considered as a procedure, shows a recursive procedure call. As a procedure can (and should in the game) be called from different places, it should be represented as an unconnected graph. Procedure calls, especially recursive calls of procedures, necessitate the introduction of a stack. The stack is a number of adjacent rectangular boxes, numbered from 1 to something suitable, in a corner of the game map. When you happen to call a procedure, you leave one of your playing pieces at the call-statement, another playing piece is moved to the first begin of the procedure and your playing piece placed in the stack moves to the stackbox with the next higher number. When you finally come to the final end of a procedure, your stackpiece moves one box backward and you resume playing at the box containing the call statement.

How do you win? Being the first to reach the final end is no condition for victory. I do like fast programs; by far the fastest of all reads: program fastest; begin end. It does exactly nothing, apart from taking time and memory from better programs. Most useful programs read something and after some computation and running to and fro some loops write some kind of an answer or a result. So that's what the game will do. Whenever a player hits an input, read or get statement, he will receive a point, meaning the program has done some reading, maybe it has just skipped some garbage or maybe some meaningful information. Whenever a player hits an output statement, he may convert a point to a victory point. Each time the program has executed an output, write or put statement, provided it didn't produce just garbage out of the blue, it has given us some information, and that's why it deserves a victory point. Ordinary points may easily get lost due to "unkind" statements.

There is another reason for victory points. Loops and procedures should not be just detours, some may be good and some evil. "Good" loops allow a player to receive victory points.

Alternative: Whenever a player hits an input statement he receives not points but some cards from a stack; the player may determine the number of cards (1, 2, 3 maybe up to 6) he wants to receive. Statement boxes may affect different kinds of cards. Conditions of selection boxes may ask for presence, absence or number of cards of certain kinds. Output statements earn a victory point, provided a player has a card of the kind stated in the output statement. The alternative allows for some influence on the progress of the game and the cards may represent variables. The value of a variable could be determined by the number of cards of a certain kind or by the value of a card just as with ordinary playing cards.

Being up to date, the game knows about semaphores. Semaphores are special boxes placed in a corner of the gamemap, together with some or more markers. Two statements affect semaphores: signed and wait, semaphores may be either open or closed, different kinds of semaphores may exist: binary semaphores, counting semaphores (original) or message semaphores (queues). Players may wait for a semaphore, i.e., they cannot proceed any further until the semaphore gets open.

Signal statements turn binary semaphores to open if closed, increase the value of counting semaphores by 1, place a suitable variable (record) card in the message semaphore box. If another player was waiting on that semaphore, he (or the first player waiting) may now continue. Binary semaphores will again get closed, counting values will be decreased by 1, message semaphores will deliver a variable card to the formerly waiting player.

Wait statements have a delaying effect if the semaphore is closed, i.e., the player hitting the wait statement must wait until the semaphore gets open, in case other players are waiting too, he has to wait until the semaphore gets open as many times as there are players waiting, including himself. A binary semaphore is always either open or closed, a counting semaphore is open if its value is greater than zero, a message semaphore is open if its box is not empty. If the semaphore is open, a wait statement will just change the state of the semaphore the same way as mentioned above for a signal statement with a waiting player.

What about deadlocks, stack-overflow, variables out of range, etc.?

I have not designed the game, but I certainly would like to play it with my kids. A board game needs a lot of balancing and design. Careful balancing might even be able to abolish the rule about simple statements (no effect when passing). As a game it should not be more complicated than the popular economic games for children, Monopoly and similar. If anyone has made the game or wants to do it, I would like to get some copies for "friends and neighbors." ☐

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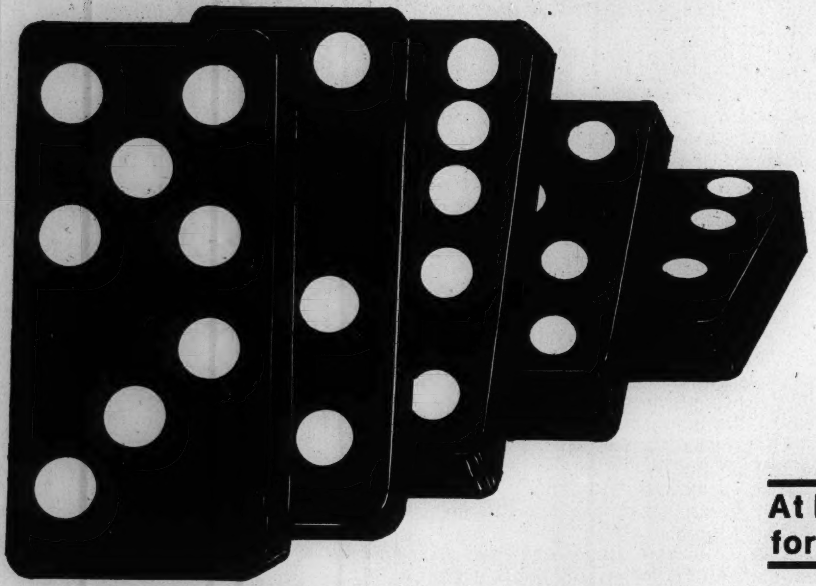
CIRCLE 151 ON READER SERVICE CARD

Another new game from Creative Computing ....

DOMINOS

A New Approach To An Old Game



Jeffrey Stec

At last — a game for APL users.

Dominos is a game written in APL which allows you to play the version of dominos known as the draw game against the computer. The program gives the playing rules, but for a more indepth view, Milton Bradley's rules accompanying the double 6 set were used. One note: at the end of a round, play continues with the next player leading off the next round. For all rounds except the first, highest double starts, or if there are no doubles, highest tile starts. For the opening round, if there are no doubles a redeal is called for.

Tiles are represented by a vector quantity and must be inputted as such. Typing 6 6 indicates the double 6 domino. At the beginning of your turn, you will be given a list of options. Each option may occur more than once such as: 0 1 1 4 6. The option is listed as many times as it occurs for strategical reasons. To play a domino, type its vector numbers. The first number is the number being matched to the board. For example, if the options are 1 5 5 6 and you wish to play a 5 6 domino as a five, type 5 6. To play the same domino as a 6 type 6 5. The computer keys only on the first number, again to prevent confusion and to aid your strategy.

Several codes are used throughout the program to indicate conditions such as who goes next, whether there's a winner, whether the round is blocked, or whether a tile is invalid or cannot be played. The standard code for a tile which is not playable is a 9 9. One example of this is when you must draw from the boneyard.

The board is represented by an nx4 array where n depends on the number and types of tiles played. Columns 1 and 3 contain the domino spots while columns 2 and 4 contain pointers to the rows of the other dominos linked to the domino under consideration. In this way, the board is reminiscient of a doubly-linked list. In the future, a playing board can be printed by following these pointers.

You now have all you need to play dominos against a computer. One note: the computer's strategy is simple. It will play the highest total points within the highest domino it can. Even with this knowledge, I challenge you to beat the computer in better than 50% of the games you play - you won't without lots of playing. □

Jeffrey Stec, 11 Upland Road, Essex Junction, VT. 05452.

Acknowledgements

I would like to thank Dr. J. William Marr of IBM who was a visiting professor at Clarkson College, and Dr. Charlie Marshall, also of Clarkson College, for their ideas, support, and encouragement while I was writing Dominos.

```
      PLAY
DO YOU WANT RULES? (Y OR N)
Y
YOU ARE ABOUT TO PLAY THE VERSION OF DOMINOS KNOWN AS THE
DRAW GAME.  NO, NOT PICTURES!!!  THE REASON FOR CALLING
IT THIS IS THAT IF A PLAYER CANNOT PLAY A DOMINO, HE MUST
DRAW ONE FROM A 'BONEYARD' OF THE AVAILABLE DOMINOS.
IF THE BONEYARD IS EMPTY, PLAY IS BLOCKED AND THE ROUND
IS ENDED.  ANOTHER WAY TO END THE ROUND IS FOR EITHER YOU
OR THE COMPUTER TO RUN OUT OF DOMINOS.  WHEN A ROUND ENDS
THE COMPUTER IS AWARDED THE NUMBER OF POINTS CORRESPONDING
TO THE SUM OF THE DOMINOS IN THE PLAYERS HAND AND THE
PLAYER RECEIVES THE SUM OF THE COMPUTERS DOMINOS.
ANOTHER ROUND IS THEN PLAYED.  IN FACT, AS MANY ROUNDS
AS ARE NEEDED BEFORE EITHER YOU OR THE COMPUTER REACHES
A PRESET (BY YOU) NUMBER OF POINTS.  THAT IS GAME.
HIT EXECUTE TO CONTINUE

TILES ARE REPRESENTED BY TWO NUMBERS FOR EACH TILE
EACH NUMBER CORRESPONDS TO HALF OF THE TILE. FOR EXAMPLE
4 2 REPRESENTS THE DOMINO WITH 4 SPOTS ON ONE END AND
2 SPOTS ON THE OTHER.  WHEN YOU ARE ASKED TO PLAY A TILE
YOU WILL BE GIVEN A LIST OF OPTIONS SUCH AS 2 2 4 5.
THIS MEANS DOMINOS HAVING A 2, 4, OR 5 MAY BE PLAYED.
THE DUPLICATION OF A NUMBER MEANS IT IS AVAILABLE TO BE
PLAYED MORE THAN ONCE.  YOU WILL ALSO BE GIVEN A LIST
OF YOUR DOMINOS.  TO PLAY A DOMINO TYPE ITS NUMBERS.
THE FIRST NUMBER WILL BE THE NUMBER TO MATCH TO THE
BOARD.  TO PLAY A 6 2 WITH THE ABOVE OPTIONS TYPE 2 6.
IF YOU CANNOT MAKE A MOVE, TYPE 9 9 AND YOU WILL THEN
DRAW FROM THE BONEYARD..... GOOD LUCK!!!
HIT EXECUTE TO CONTINUE

HOW MANY POINTS DO YOU WANT TO PLAY TO ??
⎕:
      15
YOUR HAND IS:
 0 1
 0 4
 1 6
 3 3
 4 4
 4 6
WHAT IS YOUR HIGHEST DOUBLE ??
ENTER 9 9 IF YOU DON'T HAVE ANY DOUBLES
⎕:
      4 4
I WILL OPEN WITH 6 6
YOUR OPTIONS ARE: 6 6 6 6
YOU HAVE THE FOLLOWING
 0 1
 0 4
 1 6
 3 3
 4 4
 4 6
WHAT DO YOU WISH TO PLAY??
⎕:
      6
THAT IS NOT A VALID OPTION... PLEASE TRY AGAIN
⎕:
      64
THAT IS NOT A VALID OPTION... PLEASE TRY AGAIN
⎕:
      4 6
THAT IS NOT A VALID OPTION... PLEASE TRY AGAIN
⎕:
      6 4
THANK YOU.....
I WILL PLAY
 6 5
YOUR OPTIONS ARE: 4 5 6 6
YOU HAVE THE FOLLOWING
 0 1
 0 4
 1 6
 3 3
 4 4
WHAT DO YOU WISH TO PLAY??
⎕:
      6 1
THANK YOU.....
I WILL PLAY
 5 2
YOUR OPTIONS ARE: 1 2 4 6
YOU HAVE THE FOLLOWING
 0 1
 0 4
 3 3
 4 4
WHAT DO YOU WISH TO PLAY??
⎕:
      4 4
THANK YOU.....
I WILL PLAY
 4 1
YOUR OPTIONS ARE: 1 1 2 4 4 6
YOU HAVE THE FOLLOWING
 0 1
 0 4
 3 3
WHAT DO YOU WISH TO PLAY??
⎕:
      4 0
THANK YOU.....
I WILL PLAY
 1 1
YOUR OPTIONS ARE: 0 1 1 1 1 2 4 6
YOU HAVE THE FOLLOWING
 0 1
 3 3
WHAT DO YOU WISH TO PLAY??
⎕:
      0 1
THANK YOU.....
I MUST DRAW FROM THE BONEYARD

I WILL PLAY
 6 3
YOUR OPTIONS ARE: 1 1 1 1 1 2 3 4
YOU HAVE THE FOLLOWING
 3 3
WHAT DO YOU WISH TO PLAY??
⎕:
      3 3
THANK YOU.....
THE REMAINDER OF MY HAND WAS:
 0 5
POINT EARNINGS FOR THIS ROUND ARE AS FOLLOWS:
COMPUTER 0 FOR A TOTAL OF 0
PLAYER   5 FOR A TOTAL OF 5
I WILL OPEN WITH 4 4
YOUR OPTIONS ARE: 4 4 4 4
YOU HAVE THE FOLLOWING
 0 0
 0 4
 0 5
 3 4
 1 4
 5 5
WHAT DO YOU WISH TO PLAY??
⎕:
      4 0
THANK YOU.....
I WILL PLAY
 4 2
YOUR OPTIONS ARE: 0 2 4 4
YOU HAVE THE FOLLOWING
 0 0
 0 5
 3 4
 1 4
 5 5
WHAT DO YOU WISH TO PLAY??
⎕:
      0 0
THANK YOU.....
I WILL PLAY
 2 5
YOUR OPTIONS ARE: 0 0 0 4 4 5
YOU HAVE THE FOLLOWING
 0 5
 3 4
 1 4
 5 5
WHAT DO YOU WISH TO PLAY??
⎕:
      5 5
THANK YOU.....
I WILL PLAY
 5 3
YOUR OPTIONS ARE: 0 0 0 3 4 4 5 5
YOU HAVE THE FOLLOWING
 0 5
 3 4
 1 4
WHAT DO YOU WISH TO PLAY??
⎕:
      3 4
THANK YOU.....
I WILL PLAY
 5 1
YOUR OPTIONS ARE: 0 0 0 1 4 4 4 5
YOU HAVE THE FOLLOWING
 0 5
 1 4
```

```
WHAT DO YOU WISH TO PLAY??
⎕:
      5 0
THANK YOU.....
I MUST DRAW FROM THE BONEYARD

I MUST DRAW FROM THE BONEYARD

I MUST DRAW FROM THE BONEYARD

I MUST DRAW FROM THE BONEYARD

I WILL PLAY
 0 6
YOUR OPTIONS ARE: 0 0 0 1 4 4 4 6
YOU HAVE THE FOLLOWING
 1 4
WHAT DO YOU WISH TO PLAY??
⎕:
      1 4
THANK YOU.....
THE REMAINDER OF MY HAND WAS:
 2 3
 6 6
 3 3
 3 6
POINT EARNINGS FOR THIS ROUND ARE AS FOLLOWS:
COMPUTER 0 FOR A TOTAL OF 0
PLAYER   32 FOR A TOTAL OF 37
YOU HAVE DEVASTATED ME... PLEASE UNPLUG ME FOREVER
DO YOU WANT TO PLAY ANOTHER GAME? (Y OR N)
N
THANX FOR PLAYING DOMINOS WITH ME
```

```
      ∇ADD[⎕]∇
    ∇ HAND2←TILE ADD HAND
[1]   ⍝ THIS FUNCTION ADDS A TILE TO A PLAYERS HAND
[2]    HAND←HAND,[1] TILE
[3]    HAND2←HAND
    ∇
      ∇ADDBOARD[⎕]∇
    ∇ BOARD2←TILE ADDBOARD BOARD
[1]   ⍝ THIS FUNCTION ADDS TO THE PLAYING BOARD
[2]    BOARD←(1 0 +⍴BOARD)⍴BOARD
[3]    BOARD[(1↑⍴BOARD); 1 3]←TILE
[4]    BOARD[(1↑⍴BOARD); 2 4]←0
[5]   END:BOARD2←BOARD
    ∇
      ∇CTILE[⎕]∇
    ∇ TILE←CTILE;HIGH;R;T;A
[1]   ⍝ THIS FUNCTION DETERMINES THE COMPUTERS MOVE.  STRATEGY
[2]   ⍝ IS AS FOLLOWS: 1) PLAY THE HIGHEST OPTION POSSIBLE
[3]   ⍝                2) PLAY THE HIGHEST TOTAL SUM WITHIN THE
[4]   ⍝                   HIGHEST OPTION.
[5]    A←1↑⍴CMPTR
[6]    HIGH←⌈/(((¯1+⍳7)∊OPTIONS BOARD)∧((¯1+⍳7)∊CMPTR))/(¯1+⍳7)
[7]    R←(∨/HIGH=CMPTR)/⍳A
[8]    T←(((⌈/+/CMPTR[R;])=(+/CMPTR))∧(∨/CMPTR=HIGH))/[1] CMPTR
[9]    →(0≠1↑⍴T)/END
[10]   T← 1 2 ⍴9
[11]  END:→((1↑,T)=HIGH)/OK
[12]   T←⌽T
[13]  OK:TILE←T
    ∇
      ∇DEAL[⎕]∇
    ∇ DEAL;DEALS
[1]   ⍝ THIS FUNCTION DEALS DOMINOS AT GAME STARTUP
[2]    DEALS←28?28
[3]    PLYR← 6 2 ↑⍉DOMINO[;DEALS]
[4]    CMPTR← ¯6 2 ↑⍉DOMINO[;DEALS]
[5]    DEALS←6↓DEALS
[6]    DEALS←¯6↓DEALS
[7]    BONEYARD←⍉DOMINO[;DEALS]
    ∇
      ∇DESCRIBE[⎕]∇
    ∇ DESCRIBE
[1]    'THIS WORKSPACE CONTAINS THE NECESSARY FUNCTIONS AND '
[2]    'VARIABLES TO PLAY THE VERSION OF DOMINOS KNOWN AS THE'
[3]    'DRAW GAME.  DOMINOS WAS WRITTEN BY JEFF STEC AT THOMAS'
[4]    'S CLARKSON MEMORIAL COLLEGE OF TECHNOLOGY IN THE SPRING'
[5]    'OF 1979 AS A DIRECTED STUDY PROJECT WITH J WILLIAM MARR,'
[6]    'VISITING PROFESSOR OF MATHEMATICS.  DOMINOS WAS '
[7]    'INITIALLY RUN ON AN IBM 5100 WITH APL.'
[8]    ' '
[9]    'TO START YOUR GAME OF DOMINOS, TYPE PLAY'
    ∇
```

```
      ∇DRAW[⎕]∇
    ∇ TILE←DRAW
[1]   ⍝ THIS FUNCTION DRAWS TILES FROM THE BONEYARD AT RANDOM
[2]    →((1↑⍴BONEYARD)=0)/BLOCK
[3]    TILE←BONEYARD[(?(1↑⍴BONEYARD));]
[4]    BONEYARD←TILE REMOVE BONEYARD
[5]    →END
[6]   BLOCK:'THE BONEYARD IS EMPTY... THE ROUND IS BLOCKED'
[7]    TILE← 1 2 ⍴9
[8]   END:' '
    ∇
      ∇GOCMPTR[⎕]∇
    ∇ GOCMPTR
[1]   ⍝ THIS FUNCTION PLAYS THE COMPUTERS TURN
[2]   IN:TILE←CTILE
[3]    →(18≠+/TILE)/OK
[4]    'I MUST DRAW FROM THE BONEYARD'
[5]    TILE←DRAW
[6]    →(18=+/TILE)/BLOCK
[7]    CMPTR←TILE ADD CMPTR
[8]    →IN
[9]   BLOCK:BCODE←'B'
[10]   →END
[11]  OK:UPDTBRD
[12]   'I WILL PLAY ';TILE
[13]   CMPTR←TILE REMOVE CMPTR
[14]  END:STCODE←'P'
    ∇
      ∇GOPLYR[⎕]∇
    ∇ GOPLYR
[1]   ⍝ THIS FUNCTION EXECUTES FUNCTIONS FOR THE PLAYERS TURN
[2]   IN:'YOUR OPTIONS ARE: ';OPTIONS BOARD
[3]    'YOU HAVE THE FOLLOWING';PLYR
[4]    INPUT
[5]    →(18≠+/TILE)/OK
[6]    TILE←DRAW
[7]    →(18=+/TILE)/BLOCK
[8]    'YOU HAVE DRAWN: ';TILE
[9]    PLYR←TILE ADD PLYR
[10]   →IN
[11]  BLOCK:BCODE←'B'
[12]   →END
[13]  OK:UPDTBRD
[14]   PLYR←TILE REMOVE PLYR
[15]  END:STCODE←'C'
    ∇
      ∇HIDBL[⎕]∇
    ∇ TILE←HIDBL;T
[1]   ⍝ THIS FUNCTION DETERMINES THE HIGHEST DOUBLE IN THE
[2]   ⍝ COMPUTERS HAND
[3]    →((+/(CMPTR[;1]=CMPTR[;2]))=0)/NODBL
[4]    T←⌈/[1](CMPTR[;1]=CMPTR[;2])/[1] CMPTR
[5]    →END
[6]   NODBL:T← 1 2 ⍴9
[7]   END:TILE←T
    ∇
      ∇HOWTILE[⎕]∇
    ∇ HOWTILE
[1]    'TILES ARE REPRESENTED BY TWO NUMBERS FOR EACH TILE'
[2]    'EACH NUMBER CORRESPONDS TO HALF OF THE TILE. FOR EXAMPLE'
[3]    '4 2 REPRESENTS THE DOMINO WITH 4 SPOTS ON ONE END AND'
[4]    '2 SPOTS ON THE OTHER.  WHEN YOU ARE ASKED TO PLAY A TILE'
[5]    'YOU WILL BE GIVEN A LIST OF OPTIONS SUCH AS 2 2 4 5.'
[6]    'THIS MEANS DOMINOS HAVING A 2, 4, OR 5 MAY BE PLAYED.'
[7]    'THE DUPLICATION OF A NUMBER MEANS IT IS AVAILABLE TO BE'
[8]    'PLAYED MORE THAN ONCE.  YOU WILL ALSO BE GIVEN A LIST'
[9]    'OF YOUR DOMINOS.  TO PLAY A DOMINO TYPE ITS NUMBERS.'
[10]   'THE FIRST NUMBER WILL BE THE NUMBER TO MATCH TO THE'
[11]   'BOARD.  TO PLAY A 6 2 WITH THE ABOVE OPTIONS TYPE 2 6.'
[12]   'IF YOU CANNOT MAKE A MOVE, TYPE 9 9 AND YOU WILL THEN'
[13]   'DRAW FROM THE BONEYARD..... GOOD LUCK!!!'
    ∇
      ∇INIT[⎕]∇
    ∇ INIT
[1]   ⍝ THIS FUNCTION INITIALIZES THE SCORING VARIABLES
[2]    PSCORE←0
[3]    CSCORE←0
[4]    WINCOD←' '
[5]    BCODE←' '
[6]    STCODE←' '
    ∇
      ∇INPUT[⎕]∇
    ∇ INPUT
[1]   ⍝ THIS FUNCTION ASKS FOR INPUT AND CHECKS TO SEE IF LEGAL
[2]    'WHAT DO YOU WISH TO PLAY??'
[3]   IN:TILE←⎕
[4]    →(18=+/TILE)/END
[5]    TILE←TILE LEGAL PLYR
[6]    →(20≠+/TILE)/END
[7]    'THAT IS NOT A VALID OPTION... PLEASE TRY AGAIN'
[8]    →IN
[9]   END:'THANK YOU.....'
    ∇
```

```
      ∇LEGAL[⎕]∇
    ∇ TILE2←TILE LEGAL HAND;A;B
[1]   ⍝ THIS FUNCTION DETERMINES IF A TILE CAN BE PLAYED
[2]    →(2≠⍴TILE)/ILLEGAL
[3]    →(~((1↑TILE)∊OPTIONS BOARD))/ILLEGAL
[4]    A←(+/(∧/(HAND=(⍴HAND)⍴TILE)))≠1
[5]    B←(+/(∧/(HAND=(⍴HAND)⍴⌽TILE)))≠1
[6]    →(A∧B)/ILLEGAL
[7]    →END
[8]   ILLEGAL:TILE← 10 10
[9]   END:TILE2←TILE
    ∇
      ∇LINK[⎕]∇
    ∇ BOARD2←LINK BOARD;POS
[1]   ⍝ THIS FUNCTION LINKS THE LAST ITEM ADDED TO THE
[2]   ⍝ BOARD TO THE CORRESPONDING OTHER ITEM
[3]    POS←1↑(((BOARD[;3])=1↑,TILE)∧(BOARD[;4]=0))/(⍳1↑⍴BOARD)
[4]    →((POS=0)∨(POS=1↑⍴BOARD))/C2
[5]    BOARD[POS;4]←1↑⍴BOARD
[6]    →END
[7]   C2:POS←1↑(((BOARD[;1])=1↑,TILE)∧(BOARD[;2]=0))/(⍳1↑⍴BOARD)
[8]    BOARD[POS;2]←1↑⍴BOARD
[9]   END:BOARD[(1↑⍴BOARD);2]←POS
[10]   BOARD2←BOARD
    ∇
      ∇OPEN[⎕]∇
    ∇ BOARD←OPEN TILE
[1]   ⍝ THIS FUNCTION PLACES THE FIRST TILE
[2]    BOARD← 1 4 ⍴0
[3]    BOARD[1; 1 3]←TILE
[4]    →((1↑,TILE)≠(¯1↑,TILE))/END
[5]    BOARD←TILE ADDBOARD BOARD
[6]   END:
    ∇
      ∇OPTIONS[⎕]∇
    ∇ OPTION←OPTIONS BOARD
[1]   ⍝ THIS FUNCTION DETERMINES MOVE OPTIONS
[2]    OPTION←BOARD[(BOARD[;2]=0)/(⍳1↑⍴BOARD);1]
[3]    OPTION←OPTION,BOARD[(BOARD[;4]=0)/(⍳1↑⍴BOARD);3]
[4]    OPTION←OPTION[⍋OPTION]
    ∇
      ∇PLAY[⎕]∇
    ∇ PLAY;AGAIN;BCODE;BOARD;BONEYARD;CMPTR;CPTILE;CSCORE;GAMEPT;
[1]    PLYR;PSCORE;PTILE;RUL;STCODE;TILE;WINCOD INIT
[2]    'DO YOU WANT RULES? (Y OR N)'
[3]    RUL←⍞
[4]    →('N'=1↑RUL)/NORULES
[5]    RULES
[6]    'HIT EXECUTE TO CONTINUE'
[7]    RUL←⍞
[8]    HOWTILE
[9]    'HIT EXECUTE TO CONTINUE'
[10]   RUL←⍞
[11]  NORULES:'HOW MANY POINTS DO YOU WANT TO PLAY TO ??'
[12]   GAMEPT←⎕
[13]  GO:BCODE←'
[14]   BOARD←⍳0
[15]   STCODE←START
[16]   →(STCODE='C')/PGO
[17]  CGO:GOCMPTR
[18]   →(BCODE='B')/BLOCKED
[19]   →(0=1↑⍴CMPTR)/BLOCKED
[20]  PGO:GOPLYR
[21]   →(BCODE='B')/BLOCKED
[22]   →(0≠1↑⍴PLYR)/CGO
[23]  BLOCKED:SCORE
[24]   →(WINCOD=' ')/GO
[25]   'DO YOU WANT TO PLAY ANOTHER GAME? (Y OR N)'
[26]   AGAIN←⍞
[27]   →('Y'=1↑AGAIN)/GO
[28]   'THANX FOR PLAYING DOMINOS WITH ME'
    ∇
      ∇REMOVE[⎕]∇
    ∇ HAND2←TILE REMOVE HAND
[1]   ⍝ THIS FUNCTION REMOVES A TILE FROM A PLAYERS HAND
[2]    HAND←(⍱/HAND=(⍴HAND)⍴TILE)/[1] HAND
[3]    HAND←(⍱/HAND=(⍴HAND)⍴⌽TILE)/[1] HAND
[4]    HAND2←HAND
    ∇
      ∇RULES[⎕]∇
    ∇ RULES
[1]    'YOU ARE ABOUT TO PLAY THE VERSION OF DOMINOS KNOWN AS THE'
[2]    'DRAW GAME.  NO, NOT PICTURES!!!  THE REASON FOR CALLING'
[3]    'IT THIS IS THAT IF A PLAYER CANNOT PLAY A DOMINO, HE MUST'
[4]    'DRAW ONE FROM A ''BONEYARD'' OF THE AVAILABLE DOMINOS.  '
[5]    'IF THE BONEYARD IS EMPTY, PLAY IS BLOCKED AND THE ROUND'
[6]    'IS ENDED.  ANOTHER WAY TO END THE ROUND IS FOR EITHER YOU'
[7]    'OR THE COMPUTER TO RUN OUT OF DOMINOS.  WHEN A ROUND ENDS'
[8]    'THE COMPUTER IS AWARDED THE NUMBER OF POINTS CORRESPONDING:
[9]    'TO THE SUM OF THE DOMINOS IN THE PLAYERS HAND AND THE '
[10]   'PLAYER RECEIVES THE SUM OF THE COMPUTERS DOMINOS. '
[11]   'ANOTHER ROUND IS THEN PLAYED.  IN FACT, AS MANY ROUNDS'
[12]   'AS ARE NEEDED BEFORE EITHER YOU OR THE COMPUTER REACHES'
[13]   'A PRESET (BY YOU) NUMBER OF POINTS.  THAT IS GAME.'
    ∇
```

```
      ∇SCORE[⎕]∇
    ∇ SCORE
[1]   ⍝ THIS FUNCTION DOES THE SCORING AND DECLARES
[2]   ⍝ A WINNER IF THERE IS ONE
[3]    WINCOD←' '
[4]    PSCORE←PSCORE+(+/,CMPTR)
[5]    CSCORE←CSCORE+(+/,PLYR)
[6]    →(0=1↑⍴CMPTR)/EMPTY
[7]    'THE REMAINDER OF MY HAND WAS:'
[8]    CMPTR
[9]   EMPTY:'POINT EARNINGS FOR THIS ROUND ARE AS FOLLOWS:'
[10]   'COMPUTER ';+/,PLYR;' FOR A TOTAL OF ';CSCORE
[11]   'PLAYER   ';+/,CMPTR;' FOR A TOTAL OF ';PSCORE
[12]   →((PSCORE≥GAMEPT)∨(CSCORE≥GAMEPT))/WIN
[13]   →END
[14]  WIN:→(PSCORE>CSCORE)/PWIN
[15]   →(PSCORE<CSCORE)/CWIN
[16]   'THE GAME WAS A TIE.... A PLAYOFF ROUND WILL BE HELD'
[17]   →END
[18]  CWIN:'I HAVE WON.... BETTER LUCK NEXT TIME!'
[19]   WINCOD←'W'
[20]   →END
[21]  PWIN:'YOU HAVE DEVASTATED ME... PLEASE UNPLUG ME FOREVER'
[22]   WINCOD←'W'
[23]  END:
    ∇
      ∇START[⎕]∇
    ∇ STCOD←START;A;B;CHIGH
[1]   ⍝THIS FUNCTION STARTS THE ROUND
[2]   BEGIN:DEAL
[3]    →(STCODE=' ')/FIRST
[4]    →(STCODE='C')/CP
[5]   IN2:'YOUR HAND IS:';PLYR
[6]    'ENTER YOUR HIGHEST DOUBLE OR YOUR HIGHEST TILE'
[7]    'IF YOU DO NOT HAVE ANY DOUBLES'
[8]    PTILE←⎕
[9]    →(2=⍴PTILE)/OKSOFAR
[10]   'THAT IS NOT A VALID ENTRY... TRY AGAIN'
[11]   →IN2
[12]  OKSOFAR:A←(+/(∧/(PLYR=(⍴PLYR)⍴PTILE)))≠1
[13]   B←(+/(∧/(PLYR=(⍴PLYR)⍴PTILE)))≠1
[14]   →(A∧B)/IN2
[15]   →PSTRT
[16]  CP:CPTILE←HIDBL
[17]   →(18≠+/CPTILE)/CPEND
[18]   CHIGH←1↑⌈+/CMPTR
[19]   CPTILE← 1 2 ⍴CMPTR[(CHIGH=+/CMPTR)/(⍳1↑⍴CMPTR);]
[20]  CPEND:STCODE←'C'
[21]   →CSTRT
[22]  FIRST:CPTILE←HIDBL
[23]  IN:'YOUR HAND IS:';PLYR
[24]   'WHAT IS YOUR HIGHEST DOUBLE ??'
[25]   'ENTER 9 9 IF YOU DON''T HAVE ANY DOUBLES'
[26]   PTILE← 1 2 ⍴⎕
[27]   →((1↑,PTILE)=(¯1↑,PTILE))/ISDBL
[28]   PTILE;' IS NOT A DOUBLE... '
[29]   →IN
[30]  ISDBL:→(18=+/PTILE)/OK
[31]   →(+/((∧/PLYR=(⍴PLYR)⍴PTILE)=1))/OK
[32]   'YOU DO NOT HAVE';PTILE
[33]   →IN
[34]  OK:→((18≠+/CPTILE)∨(18≠+/PTILE))/PLAY
[35]   'I DO NOT HAVE ANY DOUBLES EITHER -- REDEAL'
[36]   →BEGIN
[37]  PLAY:→((18≠+/CPTILE)∧(18=+/PTILE))/CSTRT
[38]   →((18≠+/PTILE)∧(18=+/CPTILE))/PSTRT
[39]   →((+/CPTILE)>(+/PTILE))/CSTRT
[40]  PSTRT:BOARD←OPEN PTILE
[41]   'OK... YOU OPEN WITH THE ';PTILE
[42]   PLYR←PTILE REMOVE PLYR
[43]   STCODE←'P'
[44]   →END
[45]  CSTRT:BOARD←OPEN CPTILE
[46]   'I WILL OPEN WITH ';CPTILE
[47]   CMPTR←CPTILE REMOVE CMPTR
[48]   STCODE←'C'
[49]  END:STCOD←STCODE
    ∇
      ∇UPDTBRD[⎕]∇
    ∇ UPDTBRD
[1]   ⍝ THIS FUNCTION UPDATES THE BOARD
        WITH THE TILE IN PLAY
[2]    BOARD←TILE ADDBOARD BOARD
[3]    BOARD←LINK BOARD
[4]    →((1↑,TILE)≠(¯1↑,TILE))/NODBL
[5]    BOARD←TILE ADDBOARD BOARD
[6]   NODBL:
    ∇
      ⍝ THE DOMINO VARIABLE FOLLOWS.  THIS IS THE ONLY
      ⍝ GLOBAL VARIABLE USED

      DOMINO
 0 0 0 0 0 0 0 1 1 1 1 1 1 2 2 2 2 2 3 3 3 3 4 4 4 5 5 6
 0 1 2 3 4 5 6 1 2 3 4 5 6 2 3 4 5 6 3 4 5 6 4 5 6 5 6 6
```

For North Star Systems

A Master Disk Directory

Rinaldo F. Prisco

Introduction

Get out your collection of North Star minidisks containing program and data files. If you have ever tried to find a particular file on one of several disks and had to search through many unsorted directories, the procedures discussed in this article will save you a lot of time and hair pulling.

The Problem

A (single density) North Star minidisk can contain up to 64 files. The directory for each disk resides on the first four sectors of the disk. Since the structure of the data in the directory is fixed, it does not contain codes for data types and thus cannot be read by Basic as a data file. Some indirect method must be used to access the directory listings to place them in a master directory.

A Solution

The technique described here is to LOAD the directory directly into RAM and then use Basic's EXAM (PEEK in Microsoft) function to gain access to it.

Each directory listing consists of 16 bytes:

bytes 0-7	name of file
bytes 8-9	disk address of file
bytes 10-11	size of file
byte 12	type of file
bytes 13-15	additional file information

If byte 0 contains a space (ASCII 32) then the directory listing has been deleted and should not appear in the master directory.

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Program Listing 1

```
10   REM         MASTER FILE DIRECTORY
20   REM
30   REM           Rinaldo F. Prisco
40   REM           Mathematics Dept.
50   REM         SUNY, College at Oswego
60   REM           Oswego, NY 13126
70   REM
80 DIM R$(7700)
90 A1=39936:M$="MASTER"
100  REM MEMSET 39935 FOR 32K SYSTEMS
110 !"Perform the following steps in the order listed:":!
120 !TAB(10),"1. BYE <RETURN>"
130 !TAB(10),"2. Load disk with wanted directory in drive."
140 !TAB(10),"3. RD 0 9C00 4 <RETURN>"
150 !TAB(10),"4. JP 2A14 <RETURN>"
160 !TAB(10),"5. CONT <RETURN>":!
170 STOP
180 REM   WHEN LAST DISK DIRECTORY HAS BEEN
190 REM   PROCESSED ENTER 999 FOR DISK #.
200 INPUT "What is the Disk #? ",F:N$=CHR$(F)
210 IF F=999 THEN 340
220 J=0:A=A1
230 IF EXAM(A)=32 THEN 300
240 REM
250 FOR I=0 TO 12
260   X=EXAM(A+I)
270   R$(14*K+I+1)=CHR$(X)
280 NEXT I:R$(14*K+14)=N$
290 K=K+1:IF K<550 THEN 300:!"NO MORE ROOM!":GOTO 340
300 A=A+16:J=J+1
310 IF J<64 THEN 230
320 !"Scan complete.  Ready for next file."
330 !"The master list contains",K," entries.":GOTO 110
340 !"Place disk to hold the Master Directory in drive.":STOP
350 F=INT((7*K+50)/128)+1
360 IF FILE(M$)=-1 THEN 370:DESTROY M$
370 CREATE M$,F
380 OPEN #0,M$
390 WRITE #0,R$(1,14*K)
400 CLOSE #0
410 !"All is well.  There are",K," entries.  Bye."
```

Program Listing 2

```
10 REM      - SORT MASTER DIRECTORY -
20 REM
30 DIM R$(7700),A$(14),B$(14)
40 OPEN #0,"MASTER"
50 READ #0,R$
60 N=LEN(R$)/14:M=N
70 M=INT(M/2):IF M=0 THEN 160:J=1:K=N-M
80 I=J
90 L=I+M
100 A$=R$(14*(I-1)+1,14*(I-1)+14)
110 B$=R$(14*(L-1)+1,14*(L-1)+14)
120 IF A$<B$ THEN 150
130 R$(14*(I-1)+1)=B$:R$(14*(L-1)+1)=A$
140 I=I-M:IF I>0 THEN 90
150 J=J+1:IF J>K THEN 70 ELSE 80
160 WRITE #0%0,R$
170 CLOSE #0
```

Program Listing 3

```
10 REM       - PRINT MASTER DIRECTORY -
20 REM
30 DIM R$(7700)
40 OPEN #0,"MASTER"
50 READ #0,R$
60 INPUT "HARD COPY? ",Y$:IF Y$(1,1)="Y" THEN P=2
70 !#P,TAB(4),"* * * M A S T E R  D I S K  D I R E C T",
80 !#P," O R Y * * *":!#P:!#P:!#P:!#P
90 FOR I=1 TO LEN(R$)/14
100  Q=14*(I-1):!#P,R$(Q+1,Q+8),
110  L=ASC(R$(Q+9)):H=ASC(R$(Q+10))
120  !#P,%4I,16*16*H+L,
130  L=ASC(R$(Q+11)):H=ASC(R$(Q+12))
140  !#P,%4I,16*16*H+L,
150  !#P,%4I,ASC(R$(Q+13)),ASC(R$(Q+14)),
160  IF I=INT(I/2)*2 THEN !#P ELSE !#P,TAB(35),
170 NEXT I
```

Directory, cont'd . . .

Procedure

Set aside 1024 bytes of RAM to receive each directory file. (In my 32K system I used the top 1024 bytes.) Use the MEMSET function if necessary. Load the main program (see Listing 1) and RUN it. It will list all required directions at the proper point in the program. They must be followed carefully. This involves a close interaction between BASIC, DOS and the operator. The program will STOP at times to allow you to take the required actions: jump to the DOS, load the disk in the drive, read the directory to RAM, get back to Basic, CONTinue the program. In particular, note the North Star DOS command "RD 0 9C00 4." It will read the first 4 blocks of the disk into RAM beginning at address 9C00 (HEX).

The Main Program

The program in Listing 1 has been dimensioned for a 32K system which uses the last 1024 bytes for storage of the disk directories in RAM. It has a capacity of 550 entries. If your system contains a different amount of memory, adjust the DIMension of R$ in line 80 and change the upper limit of the cumulative count, K, in line 290 accordingly. Some systems may require several secondary master files which may be merged at a later time.

Secondary Programs

Three related programs are also listed. The program in Listing 2 will sort the master file (about 12 minutes for 550 entries on an 8080). Program 3 will print the master directory to the screen (P=0) or printer (P=2) in the format described below. Program 4 is provided for those systems without a printer. It will search the sorted directory for any file names that begin with the characters returned in the INPUT statement in line 50 (very fast).

Some systems may require several secondary master files which may be merged at a later time.

Master Directory Listings

Each listing in the printout of the master directory consists of the name of the file followed by four numbers. The first three are the same as the first three in the standard North Star Directory: disk address, number of sectors, and type of file. The fourth number is the number of the disk containing the file. Two listings appear on each line (see example). ☐

Program Listing 4

```
10 REM   - SEARCH MASTER DIRECTORY -
20 REM
30 DIM R$(7700)
40 OPEN #0,"MASTER":READ #0,R$:CLOSE #0
50 INPUT "ENTER FILE NAME: ",N$:!
60 B=1:E=LEN(R$)/14:N=LEN(N$)
70 K=INT((B+E)/2):K$=R$(14*(K-1)+1,14*(K-1)+N)
80 IF N$=K$ THEN 120
90 IF B=E THEN 110
100 IF N$<K$ THEN E=K-1 ELSE B=K+1:GOTO 70
110 !N$," IS NOT IN THE MASTER FILE.":GOTO 280
120 FOR I=K-1 TO 1 STEP -1
130 IF N$<>R$(14*(I-1)+1,14*(I-1)+N) THEN EXIT 150
140 NEXT I
150 B=I+1
160 FOR I=K+1 TO LEN(R$)/14
170 IF N$<>R$(14*(I-1)+1,14*(I-1)+N) THEN EXIT 190
180 NEXT I
190 E=I-1
200 FOR I=B TO E
210 Q=14*(I-1):!#P,R$(Q+1,Q+8),
220 L=ASC(R$(Q+9)):H=ASC(R$(Q+10))
230 !#P,%4I,16*16*H+L,
240 L=ASC(R$(Q+11)):H=ASC(R$(Q+12))
250 !#P,%4I,16*16*H+L,
260 !#P,%4I,ASC(R$(Q+13)),ASC(R$(Q+14))
270 NEXT I:!:!
280 INPUT "DO YOU WANT ANOTHER SEARCH? ",Y$
290 IF Y$(1,1)="Y" THEN 50
```

```
INKEYR   160   3   2  22          INSERTS  277   5   2  25
INTVERSE 155   6   2   9          INTVERSE 216   6   2   2
INVERSE   27   5   2   2          INVERSE   79   5   2   4
INVERSES  87   2   2   6          INVNORM  147   1   2   7
JOEY      99   1   2   2          JOEY2    100   1   2   2
KCYCLES  311   2   2  14          KLINGON  109   8   2   4
KLINGON  140   8   2   2          KLINGON  161   8   2   9
LCC       99   2   2   7          LEFT     100   2   2   1
LEFT     110   2   2   3          LENTILS  243   2   3   3
LETTER1  274   5   3  16          LETTER2  279   5   3  16
LETTER2  180   5   3  19          LETTER2  212   5   3  22
LINEMOD  185   2   2  12          LINEMOD2 187   2   2  12
LINEMOD3 219   3   2  12          LINKS    270   1   2  25
LMASTER  128   4   2  27          LMASTER2 173   6   2  27
LP1      101   7   3  12          LUNAR    175  12   2   4
M.WORDS  187  12   3   4          M1       135   4   2   9
M158      79  10   3   3          MACHINE  133   2   2   9
MARKOV   119   7   2  14          MASTER   137  36   3  27
MASTERS  133   3   3  14          MATCH    199  12   2   4
MATHCAL  122   5   3  22          MATMOD    84   3   2   2
MATRIX   181   2   2   2          MATRIXM  101   3   2   2
MEAN     285   3   2  19          MEAN      76   2   2   7
MEETINGS 142   3   3   3          MEMORY24 147   2   2   4
MEMORY32 149   2   2   4          MGMTSCI  295   2   3  12
MLABEL   291   1   2  16          MMIND     62   4   2   4
MMIND    116   4   2   2          MMIND    126   7   2  14
MMIND    191   4   2  17          MMV2     151   5   2  16
MMV3     156   5   2  16          MMVIDIO  148   3   2  16
MODIFY   199   2   2  11          MOVDATA   95   2   2  22
ND       113   2   2   7          ND2      122   8   2   7
NEDIT     97  25   2  22          NEDIT2   207  24   2  16
NEWTON   182   2   2   9          NKLINGON 260   7   2   9
NKLINGON 226   7   2   2          NORM     249   3   2   9
NORMALD  111   2   2   7          OND      117   5   2   7
OTTER    268  19   3  22          OTTER    199  10   2  19
OTTER2   319   8   3  22          OTTERD   209   9   2  19
OTTERDS  221  13   2  19          OTTERV   240  12   2  19
OTTERW   291  10   2  19          OTTR     241  10   3  22
P1000     62   4   3   2          PARALLEL 171   2   2   2
PASCAL     4   2   2   2          PASCAL   185   1   2   9
PCLET2   183   5   3  26          PCLETTER 225   4   3  22
PCOTTER  307  10   2  19          PERIODS  130   3   2   6
PHIINV   201   5   2   7          PHONENUM  32  10   3   3
PLIST    209   2   2  18          PLOT      73   4   2   4
PLOT      87   4   2   2          POINTERS 281   2   2  18
POLY      75   3   2   9          POLY2     78   3   2   9
POWERS    37   2   2   2          PRES2     45   2   2   2
PRES4     47   5   2   2          PRIMES    61   1   2   2
PRIMES    84   1   2   4          QEDIT    319  20   2  12
QEDIT    110  20   2  16          QEDIT    171  20   2  17
QUEUE    119   2   2  27          QUOTIENT  69   3   2   9
R375     193   1   2   3          RACE     189  10   2  19
```

Sample Printout

Sample printout of the Master Disk Directory (taken from the middle of a 5-page list of 550 files).

puzzles & problems

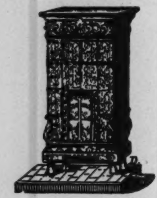
Merlin would like to thank all of our readers who have written in to point out the fact that there is more than one solution to the puzzle called "Plato's Cube" which appeared in the August issue of Creative Computing. There are, in fact, an infinite number of solutions to this problem. Merlin just forgot to mention it (so he says). Anyway, he appreciates the time and energy expended by our readers on behalf of this column. Keep up the good work!

Don't forget to send in your favorite puzzles. If Merlin uses your puzzle he will send you a free copy of one of his books.

◆

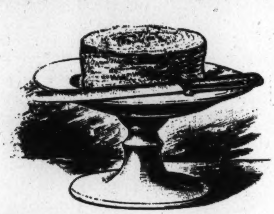
A Somber Choice

Our first problem deals with a hunter who arrives at his cabin deep in the woods on a cold and grey afternoon in the middle of winter. In the cabin he has a pipe, an oil lamp, and a wood burning stove. Unfortunately, he only has one match. Which item should he light first?



A Sweet Problem

This is indeed a "sweet" problem. One afternoon we were all gathered in Merlin's office for a coffee and cake break. On a cake server was a large, round, plain cake. "Looking at that cake reminds me of an old puzzle" said Merlin. "Everything reminds you of an old puzzle" was the instant response from around the table. "There are eight of us here at the table" went on Merlin. "Can anyone tell me how to go about cutting that cake so that we will have eight pieces, all of the same size and shape? The only stipulation I make is that the cake must be divided using only straight cuts with knife. Does the "old puzzler" hear any "new" answers from around the table?"



THE SPHINX

A) What number gives the same result whether you divide it by 5 or deduct 5 from it?

B) Which candles burn the longer, wax candles or tallow candles?

C) What kind of a clock shows the exact time of day twice a day, but is wrong at all other times?

D) What is bought by the yard yet is worn by the foot?

E) How far can you go into the woods?

F) Why is Ireland the wealthiest country in the world?

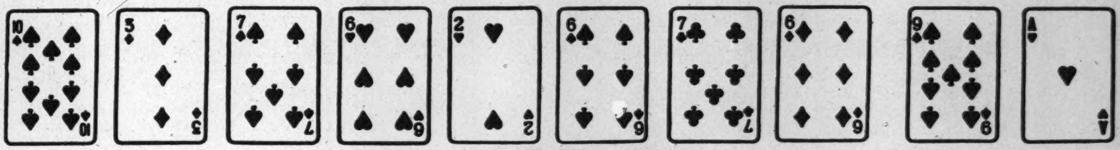
Answers on page 192.

(These riddles are from Merlin's Puzzler #1).

The Five Pairs Puzzle

Lay out a row of ten cards on the table. Starting with any card, pick it up and move it left or right over the next two cards in the row and place it on top of the third card. You now have a pair. Next, pick up another single card and pass it left or right over the next two cards in the row (a pair counts as one card), and place it on the third single card. You are to continue in this manner until you have five pairs upon the table.

(This puzzle is from Merlin's Puzzler #2)



A Tricky Test

Here is a problem to test your reasoning powers. A speedy answer is a definite plus. We have taken the numbers 1 through 14 and placed them into three boxes according to some scheme thought up by Merlin. Your puzzle is to figure out what this scheme is and to place the next three numbers, 15, 16, and 17, into the correct boxes.

Ready, on your mark, get set, go!

Box1	Box 2	Box 3
0 3 6 8 9	1 4 7 11 14	2 5 10 12 13

Some English Anagrams

Each of the following five sentences is an anagram hiding the name of a famous man of England. By rearranging the letters in each sentence you will discover their identities.

(A) We all make his praise.
(B) Dig over Tom's hill.
(C) Will it harm, O hag?
(D) John's ready soul.
(E) Throw sword.

The Rhino's Riddle

In Vol. 1 of **Merlin's Puzzler,** Rupert presented a puzzle wherein the puzzler was required to arrange eight 8's so that when they are added up they will total 1,000. The answer we gave is printed here. One of our valued readers, after pondering and solving this problem, has come forward with two more solutions to this problem. This time we want two mathematical expressions, using eight 8's, that equal 1,000.

$$\begin{array}{r} 8 \\ 8 \\ 8 \\ 88 \\ 888 \\ \hline 1{,}000 \end{array}$$

(This puzzle is from Merlin's Puzzler #2).

That's it for this month, folks. I hope that you have enjoyed the mixed bag of problems that Merlin has provided. Also, don't forget to send in your favorite puzzles.

Your Editor; Charles Barry Townsend

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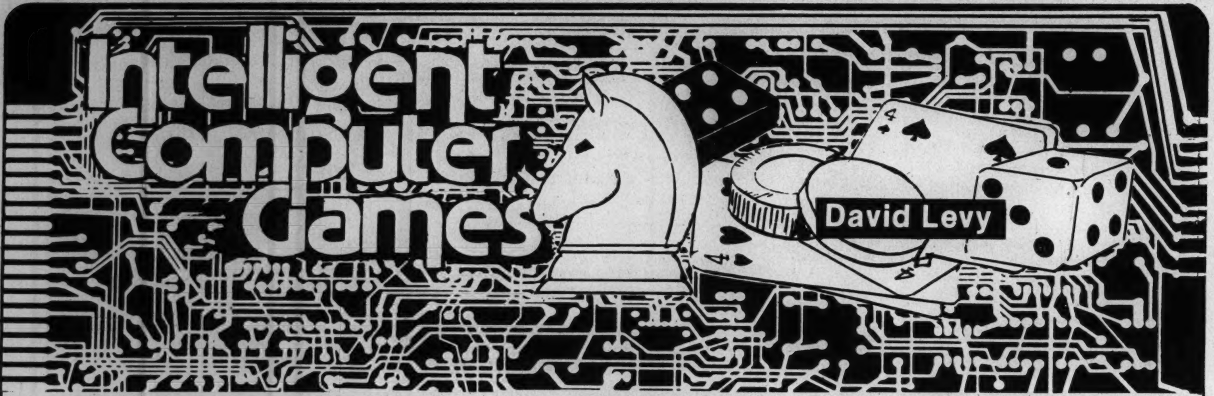


Correspondence is welcome. Letters with interesting questions and ideas will be used in the column along with a response. No personal replies can be made. Send to: David Levy, 104 Hamilton Terrace, London NW8 9UP, England.

David Levy, our newest columnist, is a noted authority in the field of intelligent computer games. He may be best known for the "Levy Wager" in which he bet several leading AI researchers (including Prof. John McCarthy of Stanford University) that he could defeat any chess-playing program developed within ten years. Mr. Levy recently collected one thousand British pounds on the bet but also faced close competition from very sophisticated chess-playing programs. He now offers $1000 to anyone whose chess program can beat him before 1984.

In this issue Mr. Levy begins with a series on programming intelligent computer games on a microcomputer. We are sure our readers will appreciate his insight into the development of practical and sophisticated game-playing programs. We welcome his addition to our staff of contributing editors and join in his request for ideas and questions from our readers. *—SN*

Introduction

Games are fun, but some games are more fun than others, depending on your taste. It has long been recognized that the type of mind required to play good chess, bridge, backgammon or poker is also likely to be adept at solving crossword puzzles and writing computer programs. Hence, it is hardly surprising that many programmers derive enormous satisfaction from programming intelligent games such as those I have mentioned.

In this series of articles I shall discuss the principles of programming a computer to play games, placing special emphasis on the particular problems posed by running these programs on a micro. My aim will be to acquaint the reader with the techniques of games programming so that (s)he will have the confidence and ability to program any intelligent game for a personal computer. Although I shall use a limited number of games in my examples, the same general principles can be applied to any game in which the computer competes against the user or users.

The series will be divided into three parts. The first part will cover all the general principles, giving examples and suggesting interesting programming tasks for the more enthusiastic reader who wishes to test his understanding of a particular topic. In part two I shall discuss some specific games in more detail and describe what work has been done in these areas so that the reader who is interested in a particular game need not re-invent the wheel. I shall also invite readers to write to me with their questions and ideas, and I shall publish the most interesting letters together with my comments (though I regret that no personal replies can be given). The third part of the series will begin when the most interesting games have already been discussed in detail, and it will be possible for me to devote most of each article to the readers' forum.

I very much hope that these articles will be interesting and informative for all of you who are "into," or would like to be into, computer games.

Input/Output

I/O on a personal computer is often largely a matter of taste, though certain points are worth bearing in mind when writing a game playing program:

1) The output should be easy to follow. You may not think this important and many programmers take the attitude that if they can understand their output nothing else matters, but how about someone else? If you want to show your program off to a friend it will be so much better received if the output is clear, concise and unambiguous. Remember to ouput any information that may be helpful. For example, in a chess program you should always announce check, checkmate and stalemate. These little touches take hardly any extra effort, and they make your program that much more attractive to another user.

2) If you want to use neat graphics or printouts, plan the layout carefully, taking into consideration all possibilities. It is not much use having your bridge program display pretty pictures of the cards if one day you discover that when you are dealt ten cards in a suit only nine of them will fit onto one line and the whole display is messed up.

3) Ensure that the user can easily see whose turn it is to play, and what the last "move" was. It can be infuriating to leave the computer for a minute or two and then return to find that the program has moved but you do not know what it has done.

4) Make it easy for the user to enter a move and to clear an incorrect move entry.

5) Ensure that the program will reject an illegal, impossible or ambiguous move, or any entry that does not conform to your simple input rules.

Games, cont'd . . .

One-Person Games

A one-person game does not involve an opponent. You play against a microcosm of the forces of nature, and if you make a mistake it may be possible to recover, and then go on to win. Solving a problem or a puzzle is a good example of a one-person game - when you get near to a solution there is no one to oppose you by suddenly making the problem more difficult. It may seem at first glance that patience games are one-person games, but in fact many patience games do not permit the player any freedom of choice, so the "game" has no real interest. Once the cards are cut the player either will or will not finish the game, and all of his decisions are made for him by the rules.

A well-known one-person game is the 8-puzzle, in which a 3 x 3 array of tiles contains the numbers 1 to 8 and an empty space. (The numbers are sometimes replaced by letters.) The player shuffles the tiles and then tries to reach some target position by successively moving tiles into the empty space. For example:

STARTING CONFIGURATION

3		8
2	5	7
1	4	6

TARGET CONFIGURATION

1	2	3
4		5
6	7	8

Figure 1

Here the task is simple, and one way in which the target can be reached from the starting configuration is by moving the tiles in the following order: 3,2,1,4,6,7,8,3,2,1,4,6,7,8,5 . With other starting and target configurations the task may be more difficult, and for those who find the 8-puzzle too simple there is always the 15-puzzle, in which a 4 x 4 array has fifteen tiles and an empty space, not to mention the 24-puzzle, the 35-puzzle and the (n^2-1)-puzzle. In fact, there is no reason, other than tradition, why the puzzles need be square.

Heuristics and Algorithms

The 8-puzzle is an excellent example of the type of problem that lends itself to solution by heuristic means. Before describing how we should set about programming games of this type, it would be as well to distinguish between the terms "heuristic" and "algorithm," which are often misunderstood.

An *algorithm* is a technique for solving a problem (the problem may be finding the best move in some game) if a solution exists. If there is no solution to the problem the algorithm should determine this fact. Thus, an algorithm always works, otherwise it is not an algorithm.

Most interesting games do not have an algorithmic solution, at least in the practical sense. Of course there is an algorithm for finding the perfect move in a game of chess - simply examine every possible move for both sides until one player is mated or a draw is established - but since the total number of chess games is greater than the number of atoms in the universe, this algorithm would be somewhat slow in practice. In contrast, however, there does exist a useful algorithm for the interesting game of Nim.

Nim is played with a number of piles of objects, often matches, and with various numbers of objects in each pile. The players move alternately, and to make a move a player must remove, from one and only one pile, any number of objects he chooses, from one object to the whole pile. The player who removes the last object loses the game. (In another version of the game the player who takes the last object is the winner.)

In order to win at Nim one need know only the following algorithm, and a few exceptional cases: ***If the number of objects in each pile is expressed in binary, and each binary column of numbers is added in decimal (without carrying numbers), then if the decimal totals are all even or zero then the person who is next to move is in a losing position.*** Here is an example.

			binary
Pile A:	1 1 1 1 1 1 1	= 7 matches =	1 1 1
Pile B:	1 1 1 1 1	= 5 matches =	1 0 1
Pile C:	1 1 1	= 3 matches =	1 1
Pile D:	1	= 1 match =	1
		totals:	2 2 4

All three totals are even so whoever moves next will lose, provided that his opponent plays correctly.

There are some obvious exceptions to the rule, for example, if piles A,B,C and D each have one match then the player who moves next will win, and the same is true of a position with only one pile of matches, provided that there are at least two matches in this pile.

The existence of this algorithm does not detract from the interest of the game since its implementation is somewhat difficult for a human being, unless the number of piles and the number of matches in each pile is small. But for a computer program the task is trivial. The program considers each move that it can make, taking one match from pile A, two matches from pile A, and so on, and it evaluates each of the resulting positions until it finds one where the decimal totals of the binary columns are all even or zero, whereupon it makes the move leading to that particular solution. Once a candidate move has been rejected it may be thrown away, so RAM is required only for the current situation, the move or decision currently under consideration, and workspace for the binary/decimal calculations. The program tries each move from the current position, and if a move is found to be unsuccessful it is "unmade," and the next move tried. In this way it is not even necessary to store both the current position and the candidate position - the program can switch to and fro between them by making and unmaking moves, a technique which is useful for saving RAM in a highly restricted memory environment.

One trick to remember for Nim, or any other game with an algorithmic method of play, is this: Should the program find itself in a theoretically losing position, as might happen at the start of the game, it should make the move that leaves its opponent with the most complex decision. In this way the opponent is more likely to make a mistake. In Nim I would suggest that if your program is in a losing position it should remove one match from the largest pile.

A *heuristic* method for solving a problem relies on common sense techniques for getting closer and closer to the solution, until the solution is actually within sight. A heuristic is therefore a rule of thumb - it will usually help us to find a solution to the problem, but it is not guaranteed to do so. In situations where a heuristic does work, it will often find the solution much faster than any algorithmic method, though some heuristics, for best results, are often employed in conjunction with an algorithm. A frequently used device which makes use of heuristics is the *tree*, and we shall now examine a method of solving the 8-puzzle by use of a tree and a simple heuristic.

Let us return to the starting configuration in Figure 1. We always refer to the starting configuration, or the point from which the program must move, as the *root* of our tree.

Games, cont'd...

Before we can decide which move might be best we must know which moves are possible, i.e. in accordance with the rules of the game. A list of these moves is usually supplied by a subroutine called a ***legal move generator***, which may be extremely complex, as in chess, or very simple, as in the 8-puzzle. It is not difficult to see that in our starting configuration there are three tiles which may be moved, 3,5 and 8. Our legal move generator would determine these moves by examining the elements of the 3 x 3 array which are horizontally or vertically adjacent to the empty space, and there are many simple methods for doing so. We might, for example, store all the legal moves in a table. If we number the elements of the array table thus:

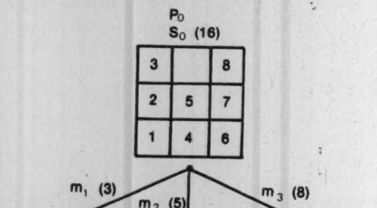
1 2 3
4 5 6
7 8 9

our table of moves might look like this:

vacant	moves
1	2,4
2	1,3,5
3	2,6
4	1,5,7
	etcetera

so that by knowing which element in the array was vacant, the program could immediately list the legal moves. This type of approach is called ***table-driven move generation***. It is often the fastest way to generate the moves but for some games it consumes too much program memory to make it a feasible proposition.

Having generated the moves 3,5 and 8 from our starting configuration, we can now begin to see the tree grow.



The ***branches*** of the tree are the moves ($m_1 m_2 m_3$) that can be made from the root of the tree. We may denote the root position by P_0, the position arising after making the move m_1 is P_1; after making the move m_2 is P_2, and after m_3 it is P_3. These positions are represented on the tree by ***nodes***.

The program now looks to see if it has solved the problem, and if it has done so it will output the move leading to the solution, followed by a statement to the effect that the game is over and it has found a solution in however many moves, which are then listed. If it has not solved the problem the program might then like to know how close each of its moves has come to providing a solution, in which case it must evaluate each of the resulting positions. This is done with a device known as an ***evaluation function*** (or scoring function), which supplies a numerical score that represents nearness to or distance from a solution.

A simple evaluation function for the 8-puzzle can be programmed by counting how many vertical and horizontal places each tile is away from its target location, and summing them. This use of the so-called "Manhattan Distance" is quite common in the computer solution of similar problems. If we examine our starting configuration we can see that :

the 3 is two places away from target
the 8 is two places away from target
the 2 is two places away from target (1 horizontally, 1 vertically)
the 5 is one place away from target
the 7,1,4 and 6 are all two places away, and the empty space (do not forget it) is one place away.

So the total of the Manhattan Distances is (2x1) + (7x2) = 16, and this is the score, S_0, which is associated with position P_0.

Counting the Manhattan Distances in P_1, P_2, and P_3, we get:

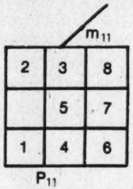
$$S_1 = 16$$
$$S_2 = 16$$
$$S_3 = 18$$

(Note that when a solution is found, S will be zero.)

So, on the basis of our evaluation function, it looks as though moves m_1 and m_2 are likely to lead to a faster solution than m_3, since positions P_1 and P_2 seem nearer the target position than does P_3. And this is where the story really begins.

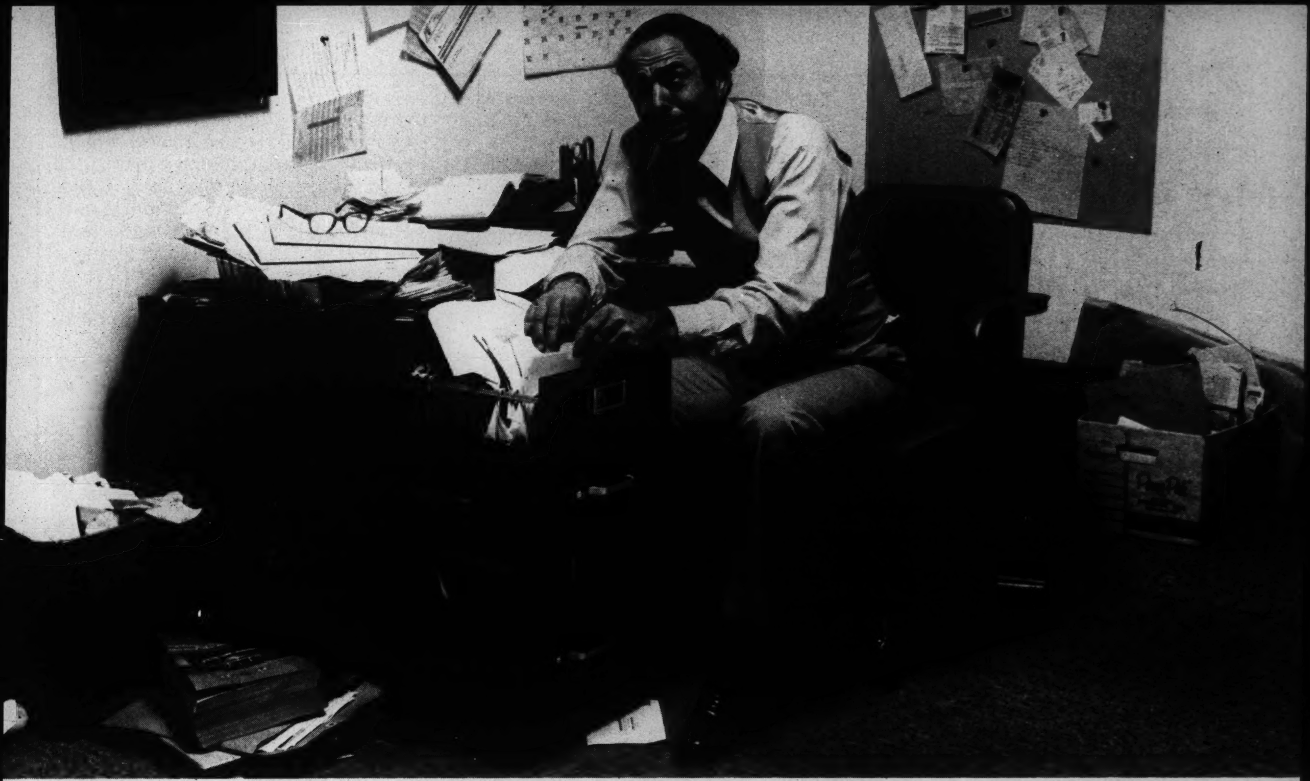
An obvious, though tedious, algorithmic solution to this problem, is to look at each of the positions P_1, P_2 and P_3, then generate all the legal moves from each of these positions and look at the newly resulting positions, then generate all the moves from these positions, and so on, until one of the positions is found to be the target (i.e. its score S, the sum of the Manhattan Distances, will be zero). Eventually, this method, which is called ***exhaustive search***, will find a solution, so long as the program does not run out of RAM. But by using a simple heuristic we can head the program in the right direction and, hopefully, a solution will be found sooner than if the exhaustive search algorithm were used.

We have seen that when we expand the node P_0, of the three new positions that appear on the tree, P_1 and P_2 appear to be more promising than P_3. It is clearly logical to expand the more promising nodes before the less promising ones, so at first we should neglect P_3 and concentrate on P_1 or P_2. Since they are of equal apparent merit, the program may choose between them at random. Let us assume that it chooses to expand P_1, from which it will generate the moves of the 2 tile and 3 tile. Since the 3 tile was moved on the previous turn, and the program is intelligent enough to know that it does not want to go back to where it had just come from, the only move (m_{11}) that the program needs to consider seriously is the move of the 2 tile, which would lead to the following position:



which we denote by P_{11}, and which has a score (S_{11}) of 14.

The best position now on the tree, i.e. the position closest to the target configuration, is P_{11}, since its score of 14 is lower than the scores of all the other nodes. So remembering not to allow the retrograde move of the 2 tile, the program now expands position P_{11}, and the choice is to move the 1 tile or the 5 tile, giving rise to the following position:



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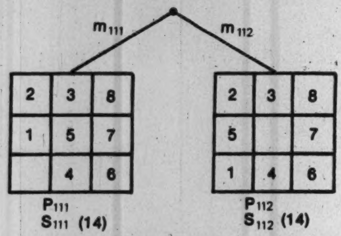
Games, cont'd . . .



Once again we have a tie, two "best" positions with scores of 14, and so the program again makes an arbitrary choice.

This process continues until a solution is found. It is easy to see that the method can hardly fail to be substantially faster than the exhaustive search process described earlier. The tree is grown intelligently, rather than in a dumb-ox manner, and better use is made of the available memory. With the exhaustive search process, unless a solution is found, the computer's memory will be filled at a stage when a very large proportion of the nodes on the tree are not of any real merit. With the heuristic approach, when memory is exhausted we at least know that most of the memory has not been wasted on unlikely moves, and we can use the best sequence of moves found so far.

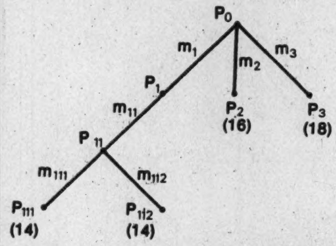
What To Do When Memory is Exhausted

Working with a personal computer inevitably poses memory constraints on a different scale from those encountered when writing for a large machine. How can the programmer combat this problem when examining large trees in an attempt to solve a one-person game? I shall describe two approaches to this particular problem:

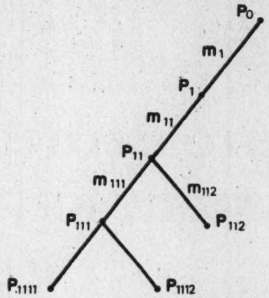
1) Follow a path through the tree to the best position found so far and output the moves on this path. Then make this "best position" into the root of a new tree and start again.

2) More intelligently, when memory becomes full, delete the currently "worst position found so far" and use the newly scrubbed bytes to store the next position that the program generates. If this process is continued for long enough, either a solution will be found or the tree will eventually have two paths, each path having no offshoots. When that happens the program must choose the best of the paths, and make the terminal position on this path into the root of the new tree, remembering to output all the moves on the path leading to this position.

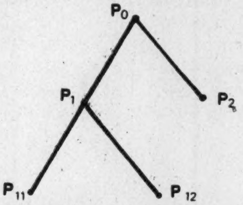
For example, our tree generated for the 8-puzzle now looks like this:



If memory is now full the program would delete m_3(and P_3), to make room for the successor position produced when it expands P_{111} or P_{112}. Let us assume that both $m_2(P_2)$ and $m_3(P_3)$ are deleted, to make way for P_{111} and P_{112}. We then have:



and the program can now output the moves m_1 and m_{11}, making position P_{11} the root of a new tree.



The new P_0 is the old P_{11}
The new P_1 is the old P_{111}
The new P_2 is the old P_{12}
The new P_{11} is the old P_{1111}
The new P_{12} is the old P_{1112}

And thus the search for a solution continues.

The Shortest Solution

In most games it is sufficient to win, but there may be reasons why one wishes to win as quickly as possible. For one-person games there exist various refinements on this method of tree searching which are likely to produce such a result.

The underlying philosophy in the search for a speedy solution is the notion that it is not only important how near (or far) you are from victory, it also matters how many moves it took you to get there. With the 8-puzzle, for example, a ten move sequence leading to a position with score 12, may not be so likely to lead to a short solution as a two move sequence leading to a score of 13 — perhaps in the next eight moves it will be possible to improve on the 13 by more than 1, thereby finding a shorter route to the solution.

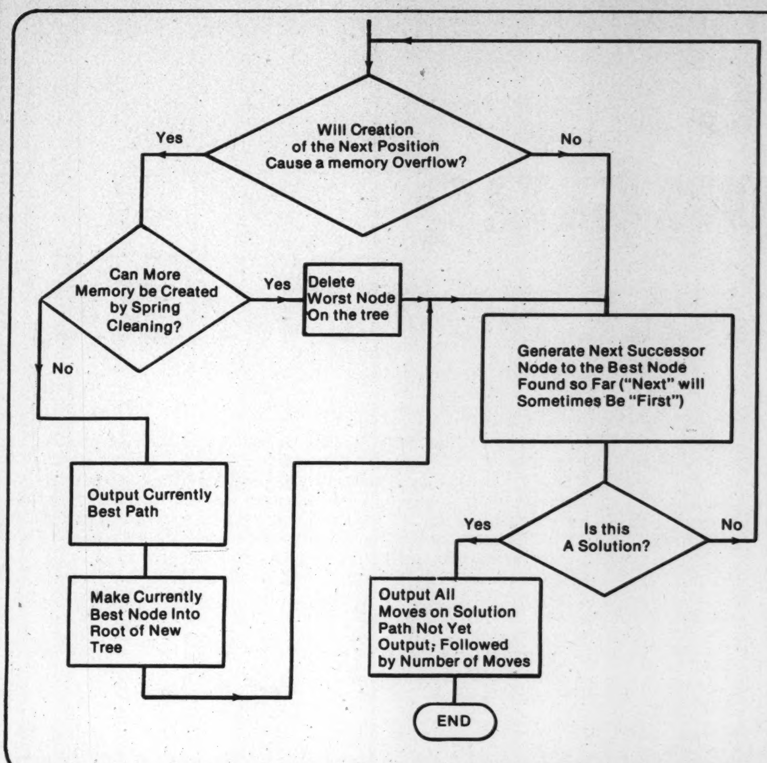
This notion might be expressed numerically in the following evaluation function:

score = sum of Manhattan Distances + M

where M is the number of moves needed to reach this position. Whether or not this expression is the best method of relating the score to effort invested and achievement realized, can only be determined by trial and error. Perhaps M should be replaced by ½M or by 2M, or some other function of M. Playing around with the evaluation function in this way, changing the terms in the function, is one of the delights of game playing programming. When you hit upon a really good evaluation function, and you see the program's performance improve dramatically as a result, there is a feeling of exhilaration rather like watching your child crawl for the first time. In a later article we shall see how evaluation functions can be modified in the light of experience gained with the program, and it will be shown that it is even possible for the program itself to learn from its mistakes and modify its own evaluation routine!

Flow Chart

A generalized global flow chart for the search of a one-person game tree is given below. Remember that the most creative part of the work lies in finding a good evaluation function and the performance of your function can be measured by the number of spurious nodes that are expanded *en route* to a solution. A perfect evaluation function will never expand a spurious node. The very worst function will expand each node at one level in the tree before looking ahead to the next level (this is exhaustive search).


Will Creation
of the Next Position
Cause a memory Overflow?
Yes
No
Can More
Memory be Created
by Spring
Cleaning?
Yes
Delete
Worst Node
On the tree
No
Generate Next Successor
Node to the Best Node
Found so Far ("Next" will
Sometimes Be "First")
Output Currently
Best Path
Yes
Is this
A Solution?
No
Make Currently
Best Node Into
Root of New
Tree
Output All
Moves on Solution
Path Not Yet
Output; Followed
by Number of Moves
END

Task for the Month

Write a program to solve the 8-puzzle in the shortest number of steps it can. Test the program by setting up various starting and target configurations, and see if your program solves the problems in fewer steps than you do. (Probably neither you, nor your program, will be as fast as Bobby Fischer, who can solve these puzzles with phenomenal rapidity.) When trying the problems yourself remember not to cheat - if you move a tile and then change your mind and move it back, add two to your count. ☐

Bibliography

Nilsson, N.J.: **Searching Problem-Solving and Game-Playing Trees For Minimal Cost Solutions**. Proceedings IFIP Conference 1968, vol. 2, pp. 1556-1562.

Schofield, P.D.A.: **Complete Solution of the 'Eight-Puzzle'**. Machine Intelligence 1 (Ed. Collins, N.L. and Michie, D.), Oliver & Boyd, 1967, pp. 125-133.

Slagle, J., and Bursky, P.: **Experiments with a Multipurpose, Theorem-Proving Heuristic Program**. Journal Association Computing Machinery, vol. 15, no. 1, pp. 85-99, January 1968.

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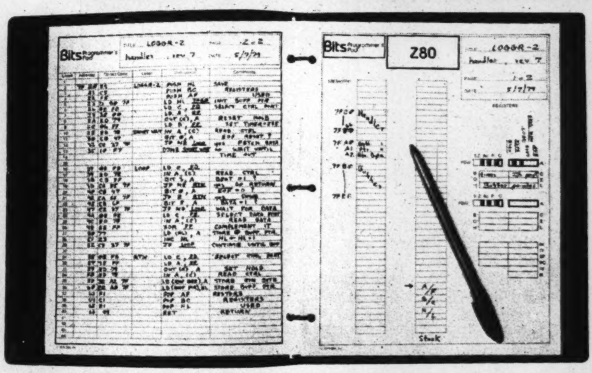

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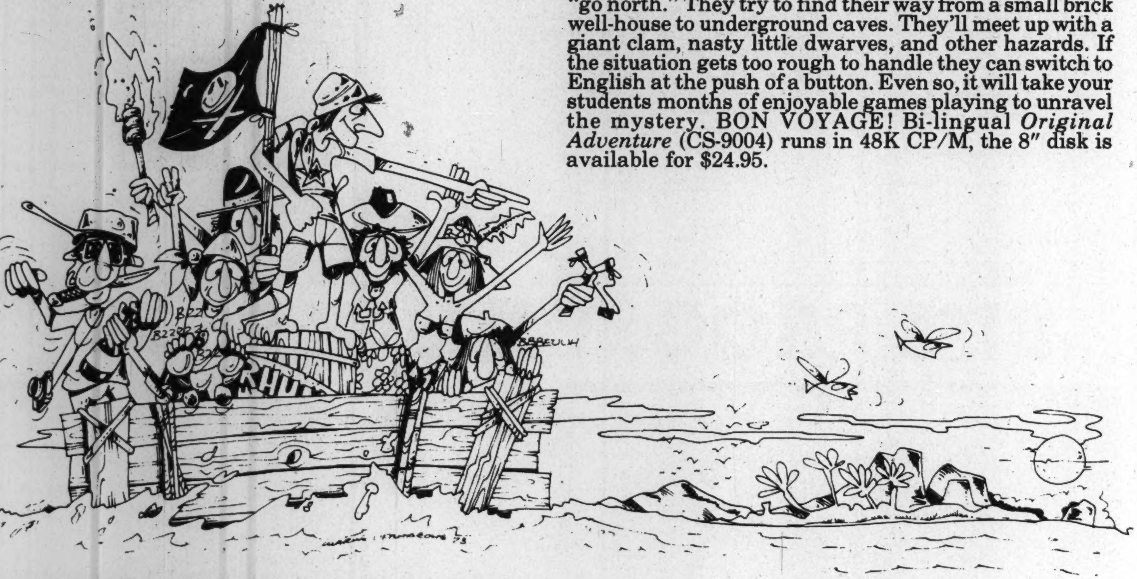

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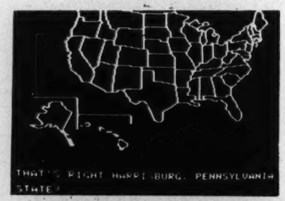
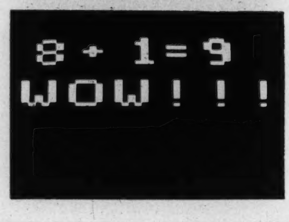


```
THAT'S RIGHT HARRISBURG, PENNSYLVANIA
STATE?
```

U.S. Map



```
8 + 1=9
WOW!!!
```

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> **80 Software Critique on**
> **Ecology Simulations-1**
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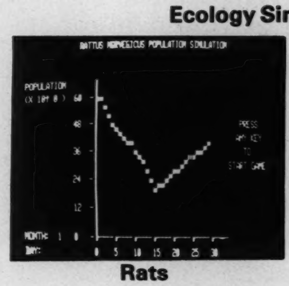
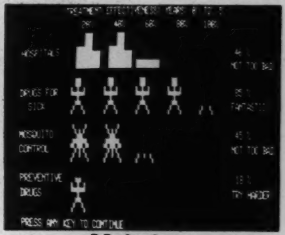
Ecology Simulations-2


RATTUS NORVEGICUS POPULATION SIMULATION
POPULATION
(X 10↑ 0)
60
48
36
24
12
0
MONTH: 1
DAY:
0
5
10
15
20
25
30
PRESS ANY KEY TO START GAME

Rats



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Software Legal Forum

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Harold L. Novick

Food for thought for February can come from comments, answers, or questions, as Van Lynn from Johnson, Kansas observed in his letter to **Creative Computing** magazine. Van mixed legal questions and opinions and concluded with the following observation: "Copyrights are, however, only as good as the ethics and morality of the people who use the material. After you have written a program or two that someone else wants, the Golden Rule seems like a darn good idea."

High morality and ethics are lofty goals and ones which this Forum strongly advocates. However, as should be obvious from prior Forum articles, what one person thinks is morally and ethically proper, another thinks is piracy.

One need only to review the position of Mr. Nunas in his letter published in last month's Forum. He believes that protection of "programs on machine-readable media" should extend only to those who exploit their software, but should not "protect that which you don't sell." **Creative Computing** magazine editor Steve North did not agree. Query: What would Mr. Nunas think if someone without his permission occupied a vacant island that he hypothetically owns in New Brunswick, and which he hopes to use in the near future. Suppose that person commercially fishes from the island and traps game. Under Mr. Nunas' philosophy, the poacher may use his own labor to reap the benefits of the island so long as Mr. Nunas was not using the island. On the other hand, there is no difference between tangible property (e.g., land, fish, game) and intangible, intellectual property (e.g. computer software), and both should belong to the owner without being subjected to the exploitation by others in the event of non-use.

One of the legal foundations of the capitalistic world is the sanctity of property. Unless there is an overriding public concern, the law permits one to do anything with that person's property so long as there is no interference with someone else's property. That not only includes the right to use the property, but also the right not to use the property and the right to refuse to allow someone else to use that property. Suppose Rembrandt were a recluse. Does he not have the right to paint his masterpieces and then deny the world the opportunity to see them?

With these philosophical underpinnings, let us return to the world of reality. Reliance on ethics and morality may be fine in an idealistic society, but in practice they cannot and should not be used alone. They are not enforceable; they vary from culture to culture, and even vary within each culture from person to person; and most importantly, they have not been recorded and do not exist in sufficient detail so as to apprise a person of what can and cannot be done. Computer professionals, business people and personal computerists alike all require a legal environment in which the permissible standards of behavior are set forth, an environment in which legal protections exist so that economic investments can be protected.

In the world of reality today, legal protection for intellectual property, including computer software, exists to one degree or another in patents, copyrights, trade secrets and contracts. Patents protect the idea, copyrights protect the expression of the idea, trade secrets protect the implemented idea and contracts protect whatever the parties to the contract agree upon. Each legal protection has its advantages and disadvantages.

A practical appreciation of the protections available from these four can be seen in the answers to the questions posed by Mr. Floyd. He writes:

> If I buy a magazine like **Creative Computing** that contains a program, do I even have the right to use the program published within? Secondly, it is clear that I cannot photocopy the pages without violating rights but if I lend or give the magazine to someone else who then enters the program in his machine the net effect is the same as photocopying since he didn't purchase the magazine. I have the good sense not to pass off a program that I have adapted or copied as my own, but if I adapt a program that's essence is a single formula and which is totally unuseable on my machine, have I violated someones rights? In other words, is a formula copyrightable?

Harold L. Novick Patent Attorney LARSON, TAYLOR & HINDS Arlington, Va. 22202

> In my manuals that came with my computer is a notation of copyright. I feel that the implication could be drawn that the very address numbers necessary to use the machine are copyrighted and thus if I tell you where to find a register or subroutine I would be breaking the law. I realize that in practice the companies want you to use the machine and are probably not deeply worried about that but yet it would appear that they could get upset. Can discovered information, being discovered independently of a copyrighted source and without knowledge of such a copyright, be a violation?
>
> Is it legal for me now to quote my own letter that I sent to you because it is copyrighted as a part of your magazine and I do not have any share of the ownership of the copyright under which it is copyrighted?

Van's questions are good ones and they reflect the general state of uncertainty and lack of knowledge in the software community. This state of affairs is understandable particularly when the legal community is divided in its opinions (note the Chicago judge's decision in the CompuChess case discussed in the January 1980 Software Legal Forum that an object program stored in a dedicated ROM is not a copy of the source program from whence it came).

Magazines are usually copyrighted and thus any software contained in the magazine usually falls under that copyright protection. Neither the purchaser of the magazine nor any subsequent reader can "copy" the software without permission. **Creative Computing** magazine gives the reader the permission to reprint material in the magazine. In this author's opinion, that is not an express permission to use a computer program printed in the magazine in a computer. However, based on the doctrine of fair use as applied by the California judge in the Betamax case (also discussed last month), it is the opinion of this author that the copying of the software into computer memory or storage on a floppy disk by the purchaser of the magazine for the purchaser's private, non-commercial use is not an infringement of the copyright. However, that right should not extend to one who "borrows" the magazine or one who "borrows" and copies the floppy disk. That person should buy his or her own copy of the magazine and create his or her own floppy disk.

The foregoing discussions about using a computer program published in a magazine were based on copyright considerations only. Clearly the program is not a trade secret because it has been published in the magazine, and clearly the magazine reader is not a party to any contract involving the program. Therefore, these forms of protection would not apply. However, the program or parts of it may have been patented. If that were the case, then no one could legally use the program without permission from the patent owner.

Patents are the key to the answer of Van's second question. A formula or mathematical algorithm cannot be copyrighted; however they may be patentable. If it is patented, then you would violate someone's rights if you used it. If the computer program or formula were legally obtained, trade secrets or contracts would not be a bar to using the formula.

The third question also involves the matter of copyrightable subject matter and further involves the scope of copyrights. Although the copyright would protect the address numbers if copied together with the entire program (assuming of course that software is copyrightable), it would not cover the underlying idea or concept and it would also not cover a separate writing about the software so long as the software is not embodied in the article. Furthermore, independently and legally discovered information protected by trade secrets can be used by the discoverer in any way in spite of the trade secret protection.

However, express knowledge of a copyright is not required and one can become liable for even an innocent copying unless the copyright notice was omitted and the innocent infringer can prove "that he or she was misled by the omission of the notice." Similarly, lack of knowledge of patent protection is no defense.

Finally, Van asked whether he could quote his own letter. If Van means, can he comment on his letter and use parts of it for "criticism, comment, news reporting, teaching, scholarship, or research," then, yes, he can because such use is "fair use" and not an infringement of copyright. However, if Van means can he otherwise use his own letter the answer may still be yes unless by addressing his letter "To The Editor" he intended to convey ownership of his copyright to **Creative Computing** magazine or dedicate the copyright to the public. In any case, it does seem that he gave the magazine the right to publish the letter.

As for the magazine's copyright covering the letter it seems the better view is that the copyright of the magazine extends only to those materials which the publisher owns. See the discussion of collected works in the November 1979 Software Legal Forum.

Most of the discussions so far in the Forum have involved copyrights. Starting next month, the discussion will turn to the patenting of computer software. Should anyone desire to do some homework, it is suggested that he or she consult one of the references listed in the "Computer Law Reading List," published and distributed free by the Center for Computer/Law, 530 W. Sixth Street, Los Angeles, CA 90014. The Center also publishes the "Computer/Law Journal," a fine legal journal that addresses many legal issues of interest to the personal computing community. Unfortunately, no single publication is known which addresses the entire subject of legal protection of computer software. The only known solution is to continue to read the monthly pronouncements in the Forum. □

Apple~Cart

Chuck Carpenter

Correspondence is always welcome and a response will be made to those accompanied by a SASE. Send your letters to: Chuck Carpenter, 2228 Montclair Pl., Carrollton, TX 75006.

The Diskette Craze

Several times over the past few months I've heard of people recording on both side of their diskettes. One source of software even ships their programs recorded this way. **This is a very risky practice.** Here's why:

- Single sided media is only certified on the normal recording side of the diskette.
- The uncertified side can have 'soft spots' that may not generate enough output to be read by the read head. Some drives will work OK, some won't.
- Diskettes spin in one direction. Dirt is collected on one side by the liner in the diskette jacket.
- When you turn the diskette over, it spins in the opposite direction. The dirt comes loose and passes under the head. Increased head and media wear is the result.
- A felt pad is used to load the head, under light pressure, against the diskette. In normal use, the pad collects dirt and bits of magnetic material.
- Pressed against the normally unrecorded side, the head load pad poses no problem. The resulting abrasion is on the unused side. You can guess what is going to happen to your programs when this abrasive pad is allowed to rub on both sides of your diskettes.

Note that two sided drives use read/write heads loaded against each other. The diskette always spins in one direction. And, the media is certified on both sides. The diskettes that "fall out" or are marginal are used for single side applications.

Also, in order to use the media on both sides, a notch must be cut in the diskette jacket. If even the smallest plastic chip gets loose and wedges inside, the magnetic surface will be scraped bare. If you're lucky this will occur outside the recording area on the diskette (If you're lucky). Assuming you can cut the second notch without making chips, some of your easily replaced programs might be saved on both sides of a diskette. If you belong to a club with a large library or can easily get another copy of a non-critical program, there is little risk. If a particular program generates a unique data base, then don't take the risk. Any special programs you write or use should only be saved on the normal recording side of unmodified diskettes.

One more point: If you insist on using both sides of a diskette, have them checked. If you have access to the new language system, Pascal, use the BAD BLOCKS function to check diskette surfaces. The higher writing density of the Pascal DOS increases the chance of finding any bad spots, too. Doing some certifying on your own will significantly improve your odds against lost data.

These comments are the result of personal experiences with dozens of disk drives and hundreds of diskettes. A recent assignment of mine included subsystem responsibility for drives and media. Also, I made a specific point of discussing the problem with Shugart Field Engineers. Their comments concurred exactly with mine.

Apple's Easy I/O

Built into your Apple is a connector (a 16 pin socket) that will allow you to sense and control things in the "outside world." There are also 8 expansion connectors for pugging in all sorts of complex circuit boards (for instance, the disk drive controllers, the serial and parallel boards, the clock boards and so on). But using these connectors is not easy and we'll leave the expansion connectors to the serious hardware designer.

Easy input and output (I/O), is provided by the game paddle connector (GP I/O). You can control and monitor a wide variety of circuits and gadgets. The input and output pin voltages are all transistor transistor logic (TTL) levels. And, there are many inexpensive TTL devices available from computer shops and electronic supply stores. The maximum voltage for TTL circuits is 5 volts. As you will see, this supply voltage is conveniently provided on the GP I/O connection. Connectors are easily made to the pins of the GP I/O with a 16 pin component header. The signals available at the GP I/O connector are:

- Four latchable bits to turn things on and off.
- Three sense bits to check for switch closure and opening.
- Four analog inputs for sensing control positions, measuring temperature or whatever.
- One utility strobe so you can control things in time with the computer.
- Power, +5 volts and ground for low current applications.

All twelve signal ports (I/O pins) are controllable from programs. The following diagram shows the arrangement of the inputs and outputs on the 16 pin GP I/O connector.

Top View

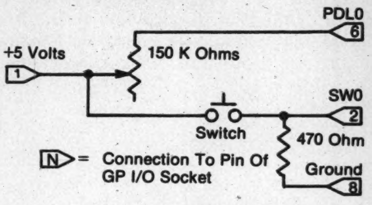
NC	9	8	Ground
PDL1	10	7	PDL2
PDL3	11	6	PDL0
AN3	12	5	Strobe
AN2	13	4	SW2
AN1	14	3	SW1
AN0	15	2	SW0
NC	16	1	+5 Volts

Location J14 On The Apple Board
Figure 1

More information about GP I/O signals can be found on pages 126, 137, 138 and 150 in the old 'Apple II Reference Manual' (the red book) and pages 23 to 25 and 100 in the new 'Apple II Reference Manual.'

Some I/O Background

Now that you know this basic information, some background on circuits to connect to the I/O pins will get things started. One thing you could connect is more game paddles and another switch. The paddles and switches that come with your Apple are connected to PDLO, SWO, PDL1 and SW1. The game paddle and switch circuit looks like this:



Typical Game Paddle Circuit

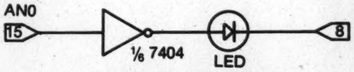
Program statements used to read the PDL and SW inputs are:

PEEK PDL (X); gives a number between 0 and 255 from one of the PDL inputs depending on the position of the variable resistor.

PEEK (addr); gives a number less than 127 if the switch is off and a number greater than 127 if the switch is closed. Using this command as an equality will test this condition. Here's one way:

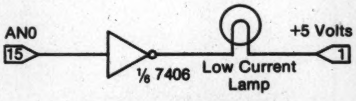
```
IF PEEK(-16286) > 127 = 1 GOTO . . .
```

Another possibility is to connect a lamp or light emitting diode (LED) to one or more of the annunciator output pins, AN0 to AN3. A circuit to connect an LED looks like this:



LED Circuit With 7404 Driver

or, a low current lamp can be connected like this:



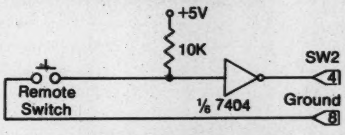
Lamp Circuit With 7406 Driver

The current available from the 5 volt supply pin is limited to 100 mA. The lowest current lamp I have found is a 6 volt, 25 mA unit from Radio Shack. Figure about 15 mA for an LED. This means that more LEDs can be connected to the AN(X) outputs with power left for the TTL buffer/amplifiers. Use of LED's will reduce the need for an external power supply. In all cases, use a TTL buffer/amplifier to drive the external circuits. You will have more circuit flexibility and the circuits in your Apple will be protected from accidents.

The two TTL devices illustrated in the circuits above are inverting types. That is, the output signal is the opposite polarity of the input signal. It's not really necessary to invert in this application. These two TTL devices are popular and inexpensive. Both types include 6 individual circuits in the 14 pin package. The 7406 is an open collector device and should be used for driving low current lamps or relays. The 7404 will work as a driver for lower current devices like the LEDs and as a logic element and buffer.

Who's There

Monitoring a remotely located switch is one task you can accomplish through the SW input pins. For instance you can connect a switch as shown in the following circuit to monitor a remote location,



Switch Sensing With 7404 Buffer

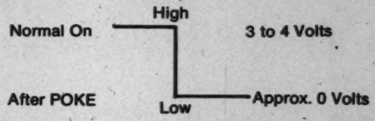
With the switch open, the 10K pullup resistor insures that the input to the 7404 is not floating and is not affected by noise on the wires. The 7404 is an inverter, so the output is a zero or low when the input is at 5 volts. When the switch is closed, the input goes to zero or low and the output goes up or high. By using the PEEK command in a Basic program the SW2 input can be tested.

```
IF PEEK (-16285) > 127 = 1 GOTO . . .
REM : switch 3 is on when true
```

When the voltage at SW2, pin 4 is near zero, the PEEK statement is false. Closing the switch causes the input to SW2, pin 4 to go to a voltage level between 3 and 4 volts. The PEEK statement will now be true and you can cause your program to respond accordingly.

Apple Turns On

Pins 12 to 15 are the latchable outputs called annunciator ports. Each of these outputs can be set from within a program by using a POKE statement. When power is first turned on, the normal level is set by the power-on reset routines in the monitor ROM. For AN0 and AN1 this level is high. A POKE to the address representing the AN(X) set or reset condition will cause the voltage to change accordingly. For instance:



To switch the voltage back high, another POKE is required; this time to a different address. For output AN0 the POKEs required are like this:

```
POKE -16296,0 : REM — SET AN0 HI
POKE -16295,0 : REM — SET AN0 LO
POKE -16296,0 : REM — SET AN0 HI
```

Using three POKEs in a row like this will generate a pulse at the AN0 pin. It will be a fairly fast pulse and if the LED circuit shown previously were connected to AN0 the LED would blink.

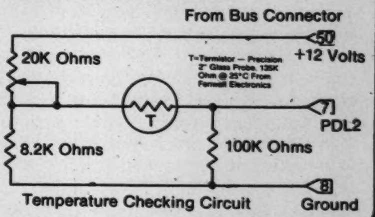
To make the LED flash on and off use a FOR NEXT loop with suitable delays between POKEs. First, it's a good idea to make sure the AN0 output is at the desired starting level. Use a POKE in your initiating routine to assure that AN0 is set HI. Then, use a program segment something like this to flash the LED:

```
FOR I = 1 TO 10
POKE -16295,0 : REM — LED IS ON
FOR J = 1 TO 200 : NEXT J
POKE -16296,0 : REM — LED IS OFF
FOR J = 1 TO 200 : NEXT J
NEXT I
RETURN
```

The same routine can also be used to flash the lamp except the on and off conditions are reversed. Depending on your requirements, you can reverse the order of POKEs, add a 7404 inverter ahead of the 7406, or leave the circuit as is. More information on addresses to use for the other latchable outputs can be found on pages 75 and 137 in the red book and page 24 of the new reference manual.

Which Way and How Far

Analog inputs, such as the output voltage from a game paddle, can be 'read' by the PDL inputs. A voltage that varies continuously between 0 and 3 volts will be converted to numbers between 255 and 0 in the computer. A game paddle is the most usual gadget connected to PDL inputs but there are many other possibilities. One such possibility is a temperature checking circuit. Here's one idea:


From Bus Connector
50
+12 Volts
20K Ohms
T=Termistor — Precision 2" Glass Probe. 135K Ohm @ 25°C From Fenwall Electronics
T
7
PDL2
8.2K Ohms
100K Ohms
8
Ground

Temperature Checking Circuit

Apple-Cart cont'd...

This circuit won't measure temperature exactly but it can be used for checking within a range. A program to read the thermal voltage could include lines like this:

```
IF X>62 AND X<68
    THEN PRINT "COOL END"
IF X>56 AND X<62
    THEN PRINT "WARM END"
```

Values used in the equalities came from an experiment where the glass bead thermistor was used as a temperature probe. Use your own values for specific applications. This circuit will have limited range because the output voltage will not go to zero. A better circuit would include a thermistor bridge with an amplifier. More linear operation and wider range temperature reading would then be possible. Notice that the supply voltage is 12 volts. The voltage was obtained by using one of the expansion connectors. A couple of 6 volt batteries would work just as well.

Any of the circuits discussed so far can be connected to a 16 pin component header. You may want to build an adapter out of a 16 pin header and a wire-wrap 16 pin socket. Solder the socket to the header, pin for pin. This way the game paddle can still be plugged in along with any special circuit you add on. Another way would be to make an extender cable. Run the cable out the back of the Apple and connect the circuits to the end of the cable. This way the cover won't have to be opened each time a new gadget is to be connected. Be sure to turn the power off before plugging in or removing any circuit from your computer.

Arley Pascal Sez

If you're experiencing problems with Pascal in your new language system, then you will appreciate these comments from N. Dealy:

1. To keep C(ompile from 'going away' or having a spectacular blow-up use the swapping or double swapping option. The directives to use are (*$S+*) and (*$S++*), respectively. These directives keep you from overflowing the 6502 and Pascal stacks.

2. Finding files is easier if you use the correct syntax from within or outside the F(ILER. Remember: Sometimes you use the suffix and sometimes you don't. You may find it handy to keep notes at hand when you first start using the system.

3. From the E(DITOR, you can write over an existing file if you Q(UIT and write to a named file. From within the editor, the system won't tell you if you already have a file by the same name. Keep a log of diskette and file names close by if this will be a problem. From the F(ILER, unlike the E(DITOR, you are prompted if you are about to destroy something.

4. The Pascal language system does not support the clock boards. You must use the D(ATE command from the F(ILER to change the date.

5. Trying to change the name of the default volume may cause some problems. The system actually has two special volumes — the default volume and the root volume. The default volume may be changed using the 'P' filer command. Any time you specify a file without specifying the volume explicitly this is the volume that is used. On the other hand, the root volume is the volume that the system was booted from and may not be changed. The work files are always written to the root volume.

6. Direct connection of the console keyboard to the printer is possible, too. (Useful if you want to enter titles on listings.) From within the F(ILER request a T(RANSFER from CONSOLE: to PRINTER:. Then type your message, header or other info and end it with a Control C. The control C signals end of file from the console and your message will be transferred to the printer.

7. When using L(INK you must specify the name you want followed by '.CODE'. Do this when you are prompted for the output file name. Otherwise, when you try to execute, you will get an error message.

Autostart ROM

Lots of things change when you plug in this new ROM chip. Some of the changes are nice and quite handy. Others can cause some inconvenience. (But only if you have had your Apple a year or more and like to use the monitor routines a lot.) Here are some of the features:

1. Automatic Basic selection if a disk drive is not installed.

2. Automatic booting if a drive is in slot 6 and a functioning diskette is in the drive.

3. Extended screen editing capability.

4. Reset returns to the Basic installed, not the monitor.

5. Stop a listing and start it again with a Control S. Allows you to examine any part of your program.

6. Suspend execution of a program with a Control S too.

Some of the differences caused with autostart in place are:

1. No direct access to the monitor. If the monitor routines are used a lot, you must use a call such as CALL-151 to get to the monitor each time reset is pressed. There are a couple of memory POKEs that can simplify this and let the reset key return program to the monitor, too.

2. Some programs taking advantage of routines in the monitor may not run. Several utility routines were replaced with new ones for autostart features.

But, for most of us, the new autostart ROM will make using the Apple easier and quite foolproof. In a business en-

```
]LIST

1000  REM  ********************
1010  REM  * DOLLAR FORMATTER *
1020  REM  ********************
1030 :
1040  LET D = 1:T = 0: DIM D$(25)
: HOME
1050  PRINT D;" ";
1060  INPUT "DOLLARS - ";D$(D)
1070  IF D$(D) = "END" GOTO 1200
1080  IF D$(D) = "0" THEN D$(D) =
"0.00"
1090  IF  MID$ (D$(D), LEN (D$(D)
) - 2,1) = "." GOTO 1130
1100  PRINT "INCORRECT FORM !"
1110  PRINT
1120  GOTO 1050
1130  IF  LEN (D$(D)) =  < 7 GOTO
1170
1140  PRINT "NUMBER TOO LONG !"
1150  PRINT
1160  GOTO 1050
1170  REM
1180  LET T = T +  VAL (D$(D))
1185  LET D = D + 1
1190  GOTO 1050
1200  LET D = D - 1
1210  PRINT
1220  FOR I = 1 TO D
1230  PRINT  TAB( 39 -  LEN (D$(I
)));D$(I)
1240  NEXT I
1250  PRINT :T$ =  STR$ (T)
1260  PRINT "TOTAL"; TAB( 30)"$";
 TAB( 39 -  LEN (T$));T$

]RUN
1 DOLLARS - 1234567
INCORRECT FORM !

1 DOLLARS - 123456.78
NUMBER TOO LONG !

1 DOLLARS - 1234.56
2 DOLLARS - 345.98
3 DOLLARS - 0
4 DOLLARS - 0.75
5 DOLLARS - 195.75
6 DOLLARS - END

                                1234.56
                                 345.98
                                   0.00
                                   0.75
                                 195.75

TOTAL                        $ 1777.04
```

Listing 1

Apple Cart cont'd...

vironment, autostart provides complete load-and-go capability, a definite advantage for operator training and use requirements.

Applesoft Formatter

Apple chose to include graphics capability over formatting in their version of Microsoft Basic. Therefore, there is no PRINT USING command and corresponding imaging formatter. For most of us this is not a problem. Sometimes, though, you may want to line up columns containing dollars and cents values. Listing 1 illustrates a routine that will do this job. Also included in the routine are number length and format checks. And, the VAL and STR$ commands are used for string and real number conversions. Let's examine the program and see how it works.

- Line 1040 initializes the variables and dimensions the length of the dollars column. Change the DIM value to be longer than your list.
- Input is accepted by lines 1050 thru line 1080. Line 1050 numbers the input line, 1060 accepts the input, 1070 checks to see if END was entered to terminate input and 1080 allows a '0' to be used if the entry has no value. My choice is to convert a no-value entry to 0.00 rather than leave it blank.
- Form is checked in line 1090. The position of the period is checked. I assumed that the form is standard 2 decimal place dollars and cents. If the entry is wrong the program returns to the input lines.
- Total length of the string of numbers is checked in line 1130. If greater than seven characters, this example program sends you back to the input lines. (The 1170 following line 1130 is part of the GOTO in line 1130.)

Note that you may want to check for alpha characters at this point. A string parsing routine can be used to check the ASCII value of each character. Of course, you can check the entry on the screen and change it before return is pressed. However, automatic error checking is more reliable; the computer doesn't get board or distracted.

- Line 1180 uses the VAL command to convert the D$ string to a real number. The value of T is adjusted with each entry and becomes the total sum of all the values entered.
- In line 1185, the counter D is incremented for each value entered. Make sure the counter is incremented **after** the total is adjusted, otherwise you will never get a correct total. Line 1190 returns to line 1050 for more input.
- When END is used to terminate input, the program branches to line 1200. Because the D counter was incremented and no additional input was made, the counter needs to be decremented by one.
- Lines 1220 to 1240 do the work of aligning all the inputs in a column. Each value is tabbed to some position, in this example 39, minus the length of the string D$.
- In line 1250, total value T is converted to a string by using the STR$ command. This was done so the total could also be tabbed into position under the column of numbers. The word TOTAL, a '$' and the value of the column are printed by line 1260.

With a disk based system, saving the input values as a file is quite straightforward. Consider how it might be done on tape using the STORE command. Hint: Remember the VAL and STR$ commands. Another program option would include the ability to subtract numbers and keep the total correct. □

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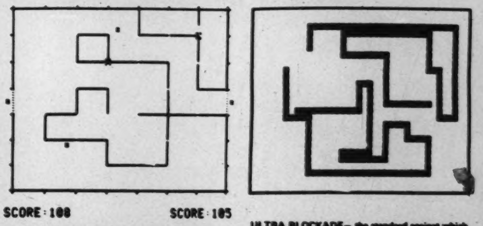

DYNAMAZE—a dazzling new real-time game. You move in a rectangular game grid, drawing or erasing walls to reflect balls into your goal (or to deflect them from your opponent's goal). Every ball in your goal is worth 100 points, but you lose a point for each unit of elapsed time and another point for each time unit you are moving. Control the speed with a game paddle: play as fast as ice hockey or as slowly and carefully as chess. Back up and replay any time you want to; it's a reversible game. By Don Stone. Integer Basic (plus machine language); 32 K; $9.95.

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PERQUACKEY—an exciting vocabulary game which pits the player against the clock. The object of the game is to form words from a group of 10 letters which the computer chooses at random. The words must be 3 to 10 characters in length with no more than 5 words of any particular length. Each player has only 3 minutes per turn. The larger the words the higher the score. Applesoft II 16K; $9.95.

APPLESHIP—is a naval game in which two players enter their ships in respective oceans. Players take turns trying to blast their opponent's ships out of the water. The first player to destroy their opponent's ships may win the game. A great low-res graphics game. Applesoft II 32K; $14.95.

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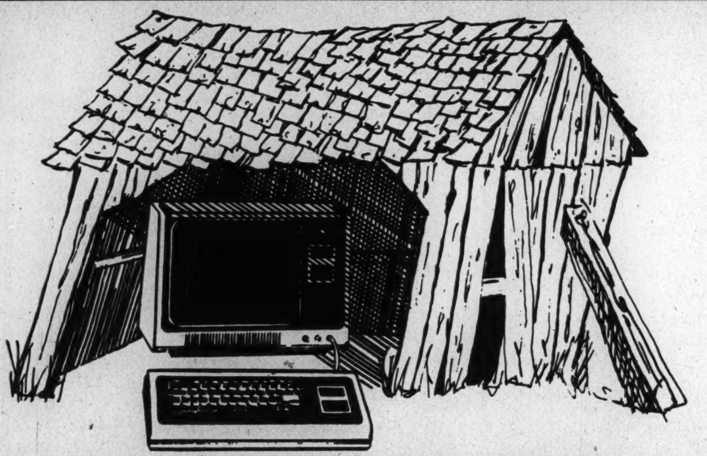
CIRCLE 173 ON READER SERVICE CARD

TRS~80 Strings

Stephen B. Gray



In this fifteenth column, we'll examine the problem of not-so-straight lines in graphics on the TRS-80 screen; two threshold detectors that can help you load marginal tapes and also copy tapes; two utility programs for editing, merging and verifying programs; and a short graphics program of interest to devotees of the cue, as well as game fans.

Not-So-Straight Lines

On the screen of a computer such as the Tektronix 4051, a straight line is always a straight line. And a circle is always a perfect circle. That's because the 4051 uses vector graphics. All the expensive graphics systems use vector graphics; prices for the Tektronix 4051 start at $5995.

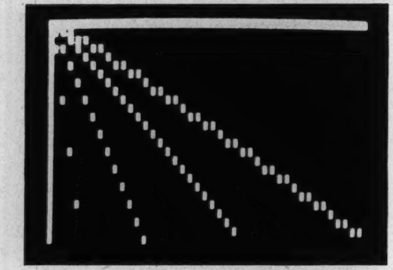
In less expensive systems, including all personal computers, raster scan is used. This is similar to a television screen, and all the graphics consist of brightened portions of horizontal raster lines. If a graphics line just happens to be exactly horizontal and is situated along a raster line, or is exactly vertical, then it will be a perfectly straight line.

This doesn't always happen, however, so that many lines in raster-scan graphics are somewhat irregular stair-steps made up of bits and pieces of short lines. This is similar to what happens in dot-matrix printing, which has to approximate, with a row of staggered dots, any straight line that's not exactly horizontal or vertical.

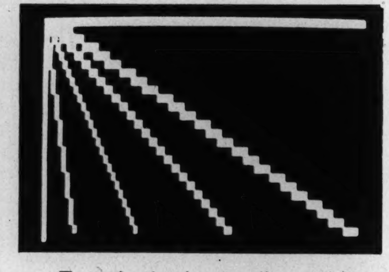
Here's a program that demonstrates what "straight" lines look like on a TRS-80, at various angles from the horizontal:

```
100 CLS
120 INPUT "ENTER STEP-SIZE (.2 TO 4)";S
130 CLS
140 FOR X=20 TO 104
150 SET(X,Y+10)
160 NEXT X
170 READ A
180 IF A=999 GOTO 250
190 FOR X=1 TO 25/A STEP S
200 Y=A*X
210 SET(X+20,Y+10)
220 NEXT X
230 GOTO 170
240 DATA .3,.5,1,3,999
250 FOR Y=10 TO 35
260 SET(20,Y)
270 NEXT Y
280 GOTO 280
```

Try several step-sizes, from 0.2 to 4, to see what effect they have on the "solidity" of the lines. The further the line is from the horizontal, the smaller the step-size has to be for a continuous line. This is important if you want your lines to be as thin as possible. A step-size of 2 results in lines like these:



while a step-size of .3, which is just enough to make the shortest stair-step line a continuous one, makes the longest stair-step line rather thick, because of overlapping:



To make that longest line as thin as possible, with no overlapping, requires a step-size of 1. Overlapping in that line begins at step-sizes of 0.9 and smaller; fragmenting begins at step-sizes of 1.1 and larger. Try step-sizes smaller than 0.2. Do they draw lines any differently than a step-size of 0.2?

In case you're wondering why the display doesn't include a line between the horizontal and the longest stair-step line, you can try to include one by adding 0.1 at the beginning of DATA line 240. Can you figure out how to prevent what happens when you do that?

You can cheat by adding these lines:

```
182 FOR X=1 TO 84 STEP S
184 Y=.1*X
186 SET(X+20,Y+10)
188 NEXT X
```

but in solving one problem, they create another. What is the new problem? How can you get around it?

Can you program a similar display, but with about 24 lines radiating a fixed distance, say about three inches, from the center of the screen, to make a sunburst display? And can you then rewrite it so that the ends of the lines touch an imaginary rectangle drawn around the display, to draw a "rising sun" flag?

An interesting but rudimentary book by Don Inman, "Introduction To TRS-80 Graphics" (Dilithium Press, Box 92, Forest Grove, OR 97116) spends almost the entire 139 pages on straight lines, except for a short chapter on Bending A Straight Line, which goes no further than sinewaves.

The problem of not-so-straight lines becomes severe if you're interested in putting something as complex as three-dimensional graphics on your TRS-80 screen. Even if you figure out how to put a 3D cube on the screen, and rotate it in various directions with matrices — which looks great in vector graphics — it will most likely look very clumsy on your TRS-80 raster-scan screen. (If you've figured out how to do

TRS-80 Strings, cont'd. . .

this neatly, please let me know.)

That's enough graphics for the moment, as there are many other things to talk about.

Can't CLOAD That Tape?

If you've bought tapes from at least half-a-dozen sources, chances are high that you couldn't CLOAD one or more of the tapes. Maybe it'll load now and then, maybe twice in a row, and then not for a week. Maybe only when Venus and Saturn are in conjunction, or when the humidity is over 93 percent. Or maybe not at all.

Two devices are available to help you read marginal tapes. Both are threshold detectors.

Data Dubber

The Data Dubber is one of several hardware and software items offered by The Peripheral People (Box 524, Mercer Island, WA 98040). Its plastic case is a little larger than the TRS-80 power supply, and contains a 9-volt battery.

The $49.95 Data Dubber, according to the catalog, "reconstructs data pulses from any tape to permit your system to CLOAD accurately and quickly . . . Corrects data pulse signals from tapes that have hum, distortion and even minor dropouts."

The four pages of operating instructions go into detail to explain problems such as caused by a single missing bit, and "why a Data Dubber is even necessary," with the help of several waveform drawings.

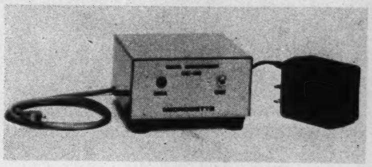
To use the Data Dubber, simply take the cord labelled Master Recorder and plug it into the EAR jack on your cassette recorder. Then take the TRS-80 cord that ordinarily plugs into the EAR jack, and plug that into the Data Dubber jack marked "TRS-80."

Using a Data Dubber, I was able to CLOAD several tapes that otherwise were difficult or impossible to load without the device. But one particular tape, of an otherwise fine program, which previously I was able to load only twice and then never again, wouldn't load at all with either threshold detector. According to the Data Dubber instructions, ". . . it won't resurrect life. If you have a tape that has never been loadable under any circumstances, don't think the Data Dubber will create any missing data. It won't."

Copying tapes with the Data Dubber is quite simple. Just connect the third lead, marked Slave Recorder, to the AUX jack of a second recorder. Using this connection, I was able to copy a machine-language tape, which as you may know is usually impossible with recorders the quality of the CTR-41.

Data Enhancer

The $45 DE-80 Data Enhancer from Microsette Co. (475 Ellis St., Mountain View, CA 94043) is also connected between the TRS-80's black plug and the recorder's EAR jack. Power is supplied by a small 6-volt battery eliminator that you plug into a wall outlet.



DE-80 is accompanied by a single page of instructions.

The DE-80 will load marginal tapes quite well, although of course it can't make up for a really bad recording. It can also be used for copying tapes, including machine-language tapes. However, you'll have to make up a cord with a male plug on each end, for connecting the DE-80's OUT jack to a second recorder's EAR jack.

Both devices contain a LED that lights whenever a signal is detected on the tape, and which can be used to find the beginning or end of programs on a cassette.

The LED can also help set the volume control properly. But because of the detector's sensitivity, the LED will light over a wider range than the range over which the TRS-80 will read the data accurately. So you have to set the volume at a narrower range than indicated by the LED.

For example, I used a program that ordinarily will load from a CTR-41 at volume-control settings between 4 and 5½. When loading this with a Data Dubber, the LED goes on when the volume control is set anywhere between 2 and 10. But the program loads correctly only when the setting is between 3½ and 6½.

The same program data turns on the Data Enhancer DE-80's LED anywhere between 6 and 10, although the program loads correctly only when the setting is between 7 and 10. (The difference between the correct-loading ranges of the two devices is due to differing circuit designs.)

Remodel

Anybody who writes Level-II TRS-80 programs of any real length should look into a couple of very helpful utilities available from RACET Computes (702 Palmdale, Orange, CA 92665).

REMODEL takes its name from its three major functions. It allows the user to REnumber any part or all of a Basic program, MOve any part from one location to another, or DELete any range of lines. This includes readjusting line-number references wherever they occur in the program.

First you load REMODEL using the SYSTEM command, then load or enter your Basic program. REMODEL resides in about 2K of the upper portion of memory. Since Basic programs to be modified reside in the lower portion of memory, they can coexist with REMODEL as long as required.

After you've loaded or entered your Basic program, you call up REMODEL by entering ?USR(0), which brings up

```
REMODEL V1.0 - ENTER DATA
START #?_   END#?     NEW#?    BY?    MODE?
```

That underline is a blinking cursor at the start of the first field on the second line. At START you enter the line number "at which the desired action is to start," at END the line number where it is to stop, at NEW the starting new line number for the statements to be renumbered or moved, at BY the line-number increment for renumbering or moving, and at MODE the code for the action required. This last needs to be specified, with DEL, only for deleting lines; the other modes are selected automatically, depending on the values of START, END and NEW.

If you've written a program that required adding many lines between the original ones, and you'd like to clean it up, simply call up REMODEL. For example, if you originally had

```
5   PRINT 1: GOTO 24
24  PRINT 2: GOTO 125
25  PRINT 3: GOTO 63
50  PRINT 4: END
63  PRINT 5: GOTO 50
125 PRINT 6: GOTO 25
```

and want to have uniform line-number increments, you interact with the computer:

```
START #?5   END#?125 NEW#?20   BY?20
```

and press ENTER. You could have put in NUM after MODE? but it isn't necessary. The system then asks permission to carry out the action you've specified, with

```
OK(Y/N)?_
```

and whether you enter Y or N, the cursor skips down to the START #? field. If you've entered Y, and then do a BREAK and LIST, you'll find

TRS-80 SOFTWARE

PACKER: Automatically edits all or part of your Basic program to ease editing, run faster, or save memory. Has 5 sections: 1. UNPACK — unpacks multiple state Basic program lines into single statements maintaining program logic. Also inserts spaces and renumbers lines for easier editing. 2. SHORT — shortens your Basic program by editing out all REM statements, unnecessary words and spaces. 3. PACK — executes UNPACK and SHORT, then packs lines into multiple statement lines. Maintains program logic. 4. RENUM — renumbers program lines including all GOTO's, etc. You specify increment. 5. MOVE — moves any line or block of lines to any new location in the program and renumbers lines. Written in machine language, supplied on tape in 3 versions for 16K, 32K, and 48K systems. Works under Level II and Disk Basic. $29.95

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TRS-80 Strings, cont'd...

```
10  PRINT 1:  GOTO 20
20  PRINT 2:  GOTO 60
30  PRINT 3:  GOTO 50
40  PRINT 4:  END
50  PRINT 5:  GOTO 40
60  PRINT 6:  GOTO 30
```

which is easier to follow than the original. If you entered N, the line numbers are not changed, and you take it from there.

With REMODEL, you can renumber just a few lines, such as changing 24 and 25 to 20 and 30, or move lines 24-50 to the end of the program, or move lines 50-63 between lines 5 and 24, or delete lines 50-63. All it takes is a few entries in the INPUT menu.

You can load REMODEL after a Basic program is in memory without destroying it, providing you've previously set the MEMORY SIZE, at power-up time, to reserve the space required for REMODEL.

REMODEL is $24.95; if you order, specify whether you have a 16K, 32K or 48K system. If you buy REMODEL and later increase your memory size, you can order a larger version "for just the cost of handling — $5.00."

PROLOAD

RACET Computes has another program, PROLOAD, which "extends the power of REMODEL with features to LOAD all or any portion of a Basic program, COMBINE Basic programs with renumbering and merging into any location, SAVE combined/merged programs or any portion to tape, and to VERIFY bit-for-bit the contents of a saved program."

The press release continues, "Users can now create libraries of Basic programs or DATA statements which can then be loaded individually or in combination with other programs, thus expanding programming productivity and versatility."

PROLOAD is a subsystem of REMODEL, and requires about 3K of memory, which includes the space required for REMODEL, with which it must be used. If you already have PROLOAD, REMODEL alone is $14.95. A combination tape, PROLOAD + REMODEL, is $34.95. Again, specify 16K, 32K or 48K.

As an example, suppose you had two programs on tape, first program A

```
10 PRINT 1: GOTO 30
15 PRINT 2: END
30 PRINT 3: GOTO 15
```

and then after it, program B

```
25 PRINT 4: GOTO 35
30 PRINT 5: STOP
35 PRINT 6: GOTO 30
```

With PROLOAD+REMODEL, you can load program A into memory, and then load program B, with its line numbers renumbered from 25-35 to 40-60, so that line 30 on the second program doesn't interfere with line 30 on the first.

Or you can load only lines 30 and 35 of program B at the end of program A, renumbering them to 50 and 60, and omitting line 25. Or load lines 30 and 35 from B between lines 15 and 30 of A, renumbering to 20 and 25. Or load 25 of B between lines 15 and 30 without renumbering.

You can also save the contents of memory in this last example, from lines 15 to 25, on tape, renaming it program C. And you can verify the tape thus produced, comparing it with the contents of memory, by using =C= in the input menu instead of C. If there's a mismatch, the display indicates BAD COMPARE.

The INPUT menu in PROLOAD is the same as described under REMODEL.

Either REMODEL or REMODEL + PROLOAD can be used while operating under DOS, and the excellent 12-page manuals that accompany each, also include an added page on how to use these utility programs with disk.

REMODEL can make programs more readable and easier to document, and PROLOAD can increase your programming productivity by allowing you to select from a library of routines.

RACET has several other machine-language utility programs, a couple of sophisticated math and optics programs in Basic, and a "special formulation cassette tape optimized for microcomputer applications."

Short Program #7

From Leiderdorp in The Netherlands comes a Level-II program, sent by W.J. Hendriks, who writes, "I have decided to send it to you because I have noticed that a lot of TRS-80 users are unable, or find it hard, to create their own TV-like ballgames. The program just shows one of the principles you should use."

```
 10 CLS:CLEAR 64:DEFINT A-Z: RANDOM
 20 X=RND(62):Y=RND(14):SX=1:SY=1
 30 PRINT @ 0,STRING$(64,176):PRINT @ 960,STRING$(63,131);:
    POKE 16383,131
 40 FOR I=64 TO 896 STEP 64:PRINT @ I,CHR$(191) TAB(63)
    CHR$(191);:NEXT I
 50 TX=X+SX:IF TX<1 OR TX>62 THEN SX=-SX:GOTO 50
 60 TY=Y+SY:IF TY<1 OR TY>14 THEN SY=-SY:GOTO 60
 70 X=TX:Y=TY:P=X+Y*64:PRINT @ P,"*";:GOSUB 100
 80 PRINT @ P," ";:GOTO 50
100 FOR TL=1 TO 5:NEXT TL:RETURN
```

The program creates a rectangle with line 40, and then within it bounces an asterisk back and forth forever, demonstrating eternally that the angle of reflection equals the angle of incidence, an important fact for pool and billiards players.

To slow down the flickering of the asterisk, change the loop in line 100 to FOR TL=1 TO 20, or to FOR TL=1 TO 50, or even more. ■

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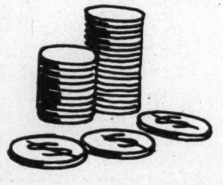
A Tape Manager/Graphics/Statistics package is also available for Level I, CS-2301 (4K) $7.95.



Investment Analysis, CS-3305 (4K)

An investment specialists tool. Programs in this package include regression analysis, stock market simulations, market/stock values, risk analysis, time related investments, and tax analysis (Levels I and II). $49.95

Text Processing, CS-3302 (16K)

This program turns your TRS-80 and line printer into a line oriented text-processing system. A special business leter format is included. You can edit and modify your work. Save text on cassette tapes, and print out perfect documents every time. There are no complicated new commands to learn so anyone can insert or delete lines with ease (for Level II). $14.95

Checking Account, CS-3304 (16K)

Keep track of where your money is going and how effective your budget is. This program helps you keep track of individual and monthly payments. Checks are automatically sorted by payee, date of payment, or other catagories and all information is saved on cassette (for Level II). $7.95

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Personal Electronic Transactions

by Gregory Yob

I am happy to hear from you, and encourage your correspondence. I will try to acknowledge all correspondence, and a SASE makes things easier for both of us. Please send your letters to "Personal Electronic Transactions" c/o PO Box 354, Palo Alto, CA 94301.

Before You Send Your PET Away . . .

When you are faced with a balky PET, there's a sneaky trick that will often restore your beloved machine to normal service. The IC sockets used by Commodore are not premium grade, and this leads to two problems as time passes. First, the changes in temperature will make some ICs tend to "walk" up out of their sockets. Second, sometimes the contacts will corrode and become flakey. (Electrically, that is.)

The cure to this is: Turn off your PET, and open the cover. Using your thumb, gently and firmly press down on every socketed IC on the main board. Several IC's will usually slide down a bit into their sockets. Close up your PET, and turn it on. In many cases, your problems will have gone away!

PET Has A Card

Those of you who knew computers before micros came along know that many manufacturers will supply small map-folded cards with summaries of their machines hardware or software printed in teeny type. All real programmers know you can't ever remember if it is MID$(A,B,C$) or MID$(A$,B$,C) or whatever — so these cards come in handy. Leading Edge at PO Box 3872, Torrance, CA, 90510 now offers a fold-out card for the PET for $3.50. The card is a concise summary of the PET's BASIC, I/O, Character set, Monitor and often used PEEK/POKE locations. Both PETs (old and new) are indicated where needed.

There are a few minor errors, but I like mine enough to keep it stashed under my PET.

PET Plotting Package

If you are one of the lucky few with an incremental plotter, West Coast Consultants, 1775 Lincoln Blvd, Tracy, CA 95376, has a plotting package, CURVE, for about $75.00. (This requires a PET with 24 or 32K in most cases). The program is initially set up for the Houston Instrument's HIPLOT plotter. I haven't been able to try this package out, but the samples I saw looked reasonably good.

Have You Noticed?

The last local PET club meeting I attended had about 100 people present — some 95 men and maybe 5 women. Of the women, only two or three seemed really interested — the others were along as companions to their men.

This is a common situation in personal computing — and it makes me wonder if personal computing is really a male-oriented hobby? In a more constructive vein, how do we get more women involved?

I am very interested in any responses — especially from any women who read this column, or men who have successfully introduced computers to women (or vice versa!)

On Tokens And Such

When a line of BASIC is entered on your PET, the characters of the keywords (like PRINT, INPUT, GOSUB, etc.) are replaced with one byte tokens. Though this does save some space (we will look into this later), the main reason for tokenizing comes when the BASIC program is RUN. Each BASIC keyword corresponds to a subroutine in the PET's ROM. When a line of BASIC is executed, the presence of a token informs the PET of where to go next. If tokens weren't there, the PET would be forced to look at the characters in the current line and check for keywords **each** time the line is executed. This is complicated and slow.

If you have an "old" PET, the tokenizing of the BASIC line leads to some odd things. (The "new" PETs have been changed to remove this problem — by having **two** tokens, GO and TO. You might want to try this out anyways.) It seems that one BASIC keyword, GOTO, is permitted to be GO TO — that is, a blank is part of the keyword in one of its variations. Since BASIC ignores blanks, and TO is a separate valid keyword, an unusual solution was used. (I have less complimentary adjectives which don't belong in these fine pages.) Here are some examples:

```
10 LISTS IN THE LAST EPICUREAN BANQUET
LIST

 10 LISTSIN THE LASTEPICUREAN BANQUET
```

The PET didn't exactly copy what you entered. Where keywords are found, blanks are removed. S IN is seen as SIN, and ST EP becomes STEP. Sometimes this is a hazard in programs, for example:

ST AND R2 becomes S TAN D R2
F OR 6 becomes FOR 6

The "cure" for the GOTO vs GO TO problem was to remove all blanks, tokenize, and then replace the blanks left between the tokens. In most practical cases, simple rearrangements or parentheses will remove any mysteries of this kind.

If you have a "new" PET, try this out and let me know what happens.

Space Savings of Tokens

Back in the early days of PET, BASIC programs from other machines were entered. Often, a 12K program could be fitted into the PET — due to the tokenizing of the keywords. An interesting question is to find out how much space is saved with the tokens for typical programs.

PET, cont'd. . .

I modified the "self-list" program (See Sep 79 Column) to look for the tokens in a BASIC program and add up the space saved by the tokens. To use this program, LOAD the program you want to measure and then append the program below. (If you have a Programmer's Toolkit! If not, LOAD your target program first and then enter this one.)

```
63000 REM TOKEN SPACE ANALYSIS
63010 REM MODIFIED FROM SELF-LISTING PGM
63020 REM BY GREGORY YOB
63030 DEF FNF(X)=PEEK(X)+256*PEEK(X+1)
63040 REM LP IS LINK POINTER
63050 REM LN IS LINE NUMBER
63060 LP=1025
63070 REM TP IS START OF TEXT
63080 REM CH IS TEXT CHAR
63090 REM MOVE DATA POINTER TO TOKENS
63100 REM ARRAY
63110 DATA *++*
63120 READA$:IFA$<>"*++*"THEN63120
63130 REM S$ HOLDS TOKENS
63140 DIMS$(75):FORJ=0TO75:READS$(J):
      NEXT
63150 DATA END,FOR,NEXT,DATA,INPUT#,
      INPUT,DIM,READ,LET,GOTO
63160 DATA RUN,IF,RESTORE,GOSUB,RETURN,
      REM,STOP,ON,WAIT
63170 DATA LOAD,SAVE,VERIFY,DEF,POKE,
      PRINT#,PRINT,CONT
63180 DATA LIST,CLR,CMD,SYS,OPEN,CLOSE,
      GET,NEW,TAB(,TO,FN
63190 DATA SPC(,THEN,NOT,STEP,+,-,*,/,↑,
      AND,OR,>,=,<
63200 DATA SGN,INT,ABS,USR,FRE,POS,SQR,
      RND,LOG,EXP,COS,SIN
63210 DATA TAN,ATN,PEEK,LEN,STR$,VAL,
      ASC,CHR$,LEFT$,RIGHT$
63220 DATA MIDS,!!OOPS!
63230 REM MAKE SAVINGS ARRAY
63240 DIM S%(75):FORJ=1TO75
63250 S%(J)=LEN(S$(!))-1:NEXT
63260 PRINT"clr TOKEN SAVING ANALYSIS"
63270 PRINT:SV=0
63280 LN=FNF(LP+2):TP=LP+4:LP=FNF(LP)
63290 IF LN=63000 THEN 63410
63300 PRINT LN;TAB(6);
63310 QQ=0
63320 CH=PEEK(TP):IFCH=0THEN63400
63330 TP=TP+1
63340 IF CH=34 THEN QQ=QQ+1AND 1
63350 IF CH >128 THEN 63320
63360 IF QQ THEN 63320
63370 IF CH >203 THEN CH=203
63380 TC=TC+1:SV=SV+S%(CH-128)
63390 PRINT S$(CH-128)" sp ";:GOTO 63320
63400 PRINT:IFLP>0THEN 63280
63410 PL=TP-1025
63420 PRINT"dn dn PROGRAM LENGTH IS :"PL
63430 PRINT"NUMBER OF TOKENS sp sp:"TC
63440 PRINT"BYTES SAVED sp sp sp sp sp sp sp
      "SV
63450 PRINT"% SAVING sp sp sp sp sp sp sp sp
      sp sp :"100*SV/PL
```

When this is RUN (from RUN 63000), the screen clears, the title is printed, and then the line numbers of the program being analyzed appear along with the tokens in that line. (It is interesting to watch the tokens patterns . . .) When the program is finished, the report appears — here is an example:

```
PROGRAM LENGTH IS : 1578
NUMBER OF TOKENS  : 143
BYTES SAVED       : 242
% SAVINGS         : 15.3358682
```

I checked several programs, mostly common games, and got these results:

Name	Length	# Tokens	Saved	% Saved
(self)	1259	106	163	12.95
BIORHYTHM	2001	264	340	16.99
LUNAR LANDER	2644	275	505	19.01
WUMPUS	4594	516	1028	22.38
SQUIGGLE	1578	143	242	15.34
BIGTIME	2025	192	484	23.90

The average savings comes to about 19% — if your program is not filled with PRINT and DATA statements, the savings will be increased. The 7167 bytes of an 8K PET are equivalent to some 8570 bytes of non-tokenized program text.

The September '79 column explains the principles used in TOKEN SPACE ANALYSIS — in this case, the program simply looks for tokens and sums up the space savings for each token.

Tokens For Text

If BASIC programs are made shorter by providing tokens for the keywords, how about using the same trick on normal text? Basic English is made of some 800 words, and some words appear more often than others.

Figure 1 shows a chart of the 100 most common English words. If you want to spend some time with a calculator (or PET), Figure 1 yields these facts: 1) About 50% of the words in ordinary text will be on this list. 2) The average savings of a token is around 3.4 characters. 3) The average text compression will be around 30%.

To see if this is true, I wrote a small (?) program which permits the entry of a text sample, tokenization and untokenization of the text — and a report on how well all this went. The first task is to make a primitive text editor and to do some initialization:

```
10 DIM L%(100),S$(100),T$(100),W$(100)
20 FORJ=1TO100:READW$(J):NEXT
100 PRINT"clr TOKEN TEXT PROGRAM
110 PRINT"-- BY GREGORY YOB
120 PRINT"dn dn MENU:
130 PRINT"dn E - EDITOR
140 PRINT"dn T - TOKENIZE
150 PRINT"dn U - UNTOKENIZE
160 PRINT"dn dn CHOICE:";
170 GETA$:IFA$=""THEN170
180 IF A$="E"THEN GOSUB 1000
190 IF A$="T"THEN GOSUB 4000
200 IF A$="U"THEN GOSUB 5000
210 GOTO 100

1000 PRINT"clr EDITOR
1010 PRINT"dn THIS IS A SIMPLE EDITOR
1020 PRINT"WHICH USES LINE NUMBERS
1030 PRINT"LIKE BASIC DOES.
1040 PRINT"dn LIST WILL SHOW THE TEXT
1050 PRINT"sp sp sp sp sp sp AND WILL
     HALT ON THE 'SPACE'
1060 PRINT"sp sp sp sp sp sp KEY.
1070 PRINT"dn EXIT LEAVES THE EDITOR.
1080 PRINT"dn dn PRESS KEY TO START
1090 GETA$:IFA$=""THEN 1090
1100 PRINT"clr";
1110 INPUT T$
1120 IF T$="LIST" THEN 1300
1130 IF T$="EXIT" THEN RETURN
1140 LN=INT(VAL(T$))
1150 IF LN<1 OR LN >32760 THEN PRINT
     "*IGNORED*":GOTO 1110
1160 GOSUB 8500
1170 IF LEN(T$)<=LEN(STR$(LN))THEN 1260
1180 T$=MID$(T$,LEN(STR$(LN))+1)
1190 REM REPLACE OR ADD TO END
1200 IF LN=L%(L) OR L%(L)=0 THEN S$(L)=
     T$:L%(L)=LN:GOTO 1110
1210 REM INSERTION (SLOW!!)
1220 IF L=101 THEN PRINT"*FULL*":GOTO 1110
1230 FORK=100 TO L+1STEP-1:L%(K)=L%(K-1)
     :S$(K)=S$(K-1):NEXT
1240 L%(L)=LN:S$(L)=T$:GOTO 1110
1250 REM DELETION
1260 IF L%(L)<>LN THEN 1110
1270 FOR K=L TO 99:L%(K)=L%(K+1):S$(K)=
     S$(K+1):NEXT
1280 L%(100)=0:S$(100)="":GOTO 1110
1290 REM LIST
1300 FOR L=1 TO 100
1310 IF L%(L)=0 THEN 1110
1320 GETA$:IFA$<>""THEN 1110
1330 PRINT L%(L)S$(L):NEXT:GOTO 1110
```

```
8500 REM SEARCH FOR LINENUMBER
8510 FOR L=1 TO 100
8520 IF LN<= L%(L) THEN RETURN
8530 IF L%(L) = 0 THEN RETURN
8540 NEXT:RETURN

9000 DATA A,ABOUT,AFTER,ALL,AN,AND,ANY,
     ARE,AS,AT,BE,BEEN,BUT,BY,CAN,COULD,
     DO
9010 DATA EVEN,FIRST,FOR,FROM,GREAT,HAD,
     HAS,HAVE,HE,HER,HIM,HIS,I,IF,IN,
     INTO
9020 DATA IS,IT,ITS,LIKE,MADE,MAN,MAY,
     ME,MIGHT,MORE,MOST,MUCH,MUST,MY,
     NEW,NO
9030 DATA NOT,NOW,OF,OLD,ON,ONE,ONLY,OR,
     OTHER,OUR,OUT,OWN,SAID,SHALL,SHE
9040 DATA SHOULD,SO,SOME,SUCH,THAN,THAT,
     THE,THEIR,THEM,THEN,THERE,THESE
9050 DATA THEY,THIS,THOSE,TIME,TO,TWO,
     UP,UPON,US,VERY,WAS,WE,WELL,WERE
9060 DATA WHAT,WHEN,WHICH,WHO,WILL,WITH,
     WOULD,YET,YOU,YOUR
```

So, what does this get us? The arrays in Line 10 are: L%() to hold the line numbers in the Editor, S$() to hold the untokenized text, T$() to hold tokenized text, and W$() to hold the 100 most common English words. Line 20 reads the words into W$, and Lines 100 to 210 take care of a simple menu and GOSUBs to the selected action. At present, only "E" will work.

The DATA statements in 9000 hold the words list. Don't worry about the 3-line lines — they **will** fit on the PET, and are expanded here for layout into one column.

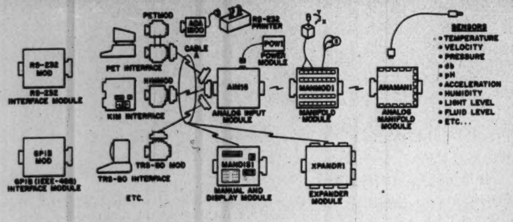
The Editor is designed to work like the PET's BASIC editor — you enter a line number and some text. A line number by itself will delete a line. The line numbers are stored in L%, and the text in S$. These are kept in increasing order of line numbers — which means a bit of shuffling when an insertion or deletion is done. If you need a **minimal** Editor, steal this code!

Lines 1000 to 1090 simply explain the Editor — I am too lazy to just show it once — so you will see the instructions every time you select "E." Lines 1110 to 1130 enter a line and check for

"The company replaced me by a computer Ethel!... I wonder what comes next!" ©Creative Computing

Data Acquisition Modules

DAM SYSTEMS


PETMOD
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RS-232 MOD
RS-232 INTERFACE MODULE
PET INTERFACE
CABLE A
POW1 POWER MODULE
KIMMOD
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AIM16
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MANMOD1
MANIFOLD MODULE
ANAMAN1
ANALOG MANIFOLD MODULE
SENSORS
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• VELOCITY
• PRESSURE
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XPANDR1
EXPANDER MODULE

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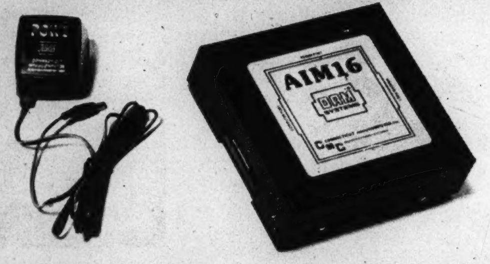
The goal of Connecticut microComputer in designing the DAM SYSTEMS is to produce easy to use, low cost data acquisition modules for small computers. As the line grows we will add control modules to the system. These acquisition and control modules will include digital input sensing (e.g. switches), analog input sensing (e.g. temperature, humidity), digital output control (e.g. lamps, motors, alarms), and analog output control (e.g. X-Y plotters, or oscilloscopes).

Analog Input Module


POW1
AIM16
DAM SYSTEMS

The AIM16 is a 16 channel analog to digital converter designed to work with most microcomputers. The AIM16 is connected to the host computer through the computer's 8 bit input port and 8 bit output port, or through one of the DAM SYSTEMS special interfaces.

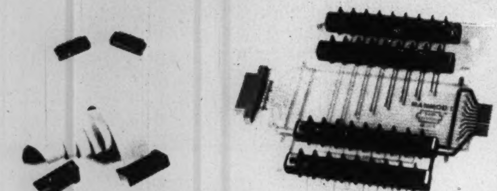
The input voltage range is 0 to 5.12 volts. The input voltage is converted to a count between 0 and 255 (00 and FF hex). Resolution is 20 millivolts per count. Accuracy is 0.5% ± 1 bit. Conversion time is less than 100 microseconds per channel. All 16 channels can be scanned in less than 1.5 milliseconds.

Power requirements are 12 volts DC at 60 ma.

The POW1 is the power module for the AIM16. One POW1 supplies enough power for one AIM16, one MANMOD1, sixteen sensors, one XPANDR1 and one computer interface. The POW1 comes in an American version (POW1a) for 110 VAC and in a European version (POW1e) for 230 VAC.

AIM16 . . . $179.00
POW1a . . . $ 14.95
POW1e . . . $ 24.95

Connectors



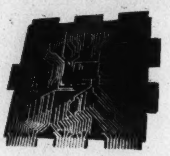
The AIM16 requires connections to its input port (analog inputs) and its output port (computer interface). The ICON (Input CONnector) is a 20 pin, solder eyelet, edge connector for connecting inputs to each of the AIM16's 16 channels. The OCON (Output CONnector) is a 20 pin, solder eyelet edge connector for connecting the computer's input and output ports to the AIM16.

The MANMOD1 (MANifold MODule) replaces the ICON. It has screw terminals and barrier strips for all 16 inputs for connecting pots, joysticks, voltage sources, etc.

CABLE A24 (24 inch interconnect cable has an interface connector on one end and an OCON equivalent on the other. This cable provides connections between the DAM SYSTEMS computer interfaces and the AIM16 or XPANDR1 and between the XPANDR1 and up to eight AIM16s.

ICON . . . $ 9.95
OCON . . . $ 9.95
MANMOD1 . . . $59.95
CABLE A24 . . . $19.95

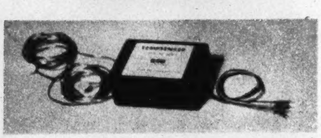
XPANDR1



The XPANDR1 allows up to eight AIM16 modules to be connected to a computer at one time. The XPANDR1 is connected to the computer in place of the AIM16. Up to eight AIM16 modules are then connected to each of the eight ports provided using a CABLE A24 for each module. Power for the XPANDR1 is derived from the AIM16 connected to the first port.

XPANDR1 . . . $59.95

TEMPSENS

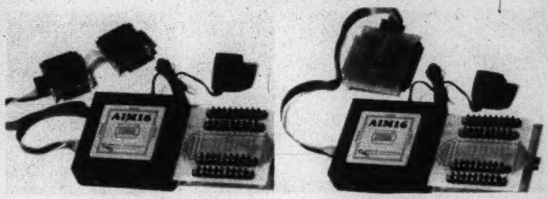


This module provides two temperature probes for use by the AIM16. This module should be used with the MANMOD1 for ease of hookup. The MANMOD1 will support up to 16 probes (eight TEMPSENS modules).

Resolution for each probe is 1°F.

TEMPSENS2P1 (-10°F to 120°F) . . . $49.95

Computer Interfaces and Sets



For your convenience the AIM16 comes as part of a number of sets. The minimum configuration for a usable system is the AIM16 Starter Set 1. This set includes one AIM16, one POW1, one ICON and one OCON. The AIM16 Starter Set 2 includes a MANMOD1 in place of the ICON. Both of these sets require that you have a hardware knowledge of your computer and of computer interfacing.

For simple plug compatible systems we also offer computer interfaces and sets for several home computers.

The PETMOD plugs into the back of the Commodore PET computer and provides two PET IEEE ports, one user port and one DAM SYSTEMS port. The PETMOD is connected to the AIM16 or XPANDR1 with CABLE A24. The PETSET1 includes one PETMOD, one CABLE A24, one AIM16, one POW1 and one MANMOD1. To read and display a single AIM16 channel (N) using the PETSET1 the BASIC statements

```
POKE59426,N:POKE59426,255:X=PEEK(59471):PRINT"CHANNEL "N"="X
```

are all that is needed.

The KIMMOD plugs into the COMMODORE KIM applications connector and provides one application connector and one DAM SYSTEM'S port. The KIMMOD is connected to the AIM16 or XPANDR1 with CABLE A24. Assembly and machine language programs for reading and displaying data are included. The KIMSET1 includes one KIMMOD, one CABLE A24, one AIM16, one POW1 and one MANMOD 1.

All sets come in American and European versions.

AIM16 Starter Set 1a (110 VAC)	**$189.00**
AIM16 Starter Set 1e (230 VAC)	**$199.00**
AIM16 Starter Set 2a (110 VAC)	**$259.00**
AIM16 Starter Set 2e (230 VAC)	**$269.00**
PETMOD	**$ 49.95**
KIMMOD	**$ 39.95**
PETSET 1a	**$295.00**
PETSET1e	**$305.00**
KIMSET1a	**$285.00**
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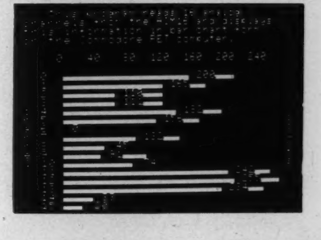

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THE COMMONEST ENGLISH WORDS

Below are listed the hundred most frequently used words in English. The figures give occurrences in 242,432 words of English text taken from fifteen English authors and many newspapers. Compiled by Frank R. Fraprie.

THE	15568	OR	1101	WHEN	603	ONLY	309
OF	9767	HER	1093	WHAT	570	ANY	302
AND	7638	HAD	1062	YOUR	533	THEN	298
TO	5739	AT	1053	MORE	523	ABOUT	294
A	5074	FROM	1039	WOULD	516	THOSE	288
IN	4312	THIS	1021	THEM	498	CAN	285
THAT	3017	MY	963	SOME	478	MADE	284
IS	2509	THEY	959	THAN	445	WELL	283
I	2292	ALL	881	MAY	441	OLD	282
IT	2255	THEIR	824	UPON	430	MUST	280
FOR	1869	AN	789	ITS	425	US	279
AS	1853	SHE	775	OUT	387	SAID	276
WITH	1849	HAS	753	INTO	387	TIME	273
WAS	1761	WERE	752	OUR	386	EVEN	272
HIS	1732	ME	745	THESE	385	NEW	265
HE	1727	BEEN	720	MAN	383	COULD	264
BE	1535	HIM	708	UP	369	VERY	259
NOT	1496	ONE	700	DO	360	MUCH	252
BY	1392	SO	696	LIKE	354	OWN	251
BUT	1379	IF	684	SHALL	351	MOST	251
HAVE	1344	WILL	680	GREAT	340	MIGHT	250
YOU	1336	THERE	668	NOW	331	FIRST	249
WHICH	1291	WHO	664	SUCH	328	AFTER	247
ARE	1222	NO	658	SHOULD	327	YET	247
ON	1155	WE	638	OTHER	320	TWO	244

Figure 1 - Common Words Table

the two commands LIST and EXIT. Line 1140 grabs the line number and 1150 checks for a legal number. (remember that 32767 is the largest legal integer in the PET.) An illegal line is *IGNORED*.

Subroutine 8500 scans through the line numbers array L% to find where the entered line should go. A zero line number in L% means that all the current lines have been looked at. We end up with these possibilities:

1) L = 101
   The text area is full. (unlikely!)
2) L%(L) = 0
   Add line to end of text.
3) L%(L) = LN
   Change a line or delete it.
4) L%(L)<>LN
   Insert or ignore.

These conditions will be handy later.

Line 1170 is a check for a line number without text — and jumps to the deletion code. Line 1200 checks for replacement or adding to the end of text. Fortunately, the add-to-end is simply replacing the line at L which was previously empty. The line number is replaced (often not needed, but not worth checking for) and the text inserted in S$.

Insertion is slow and painful (cause I'm lazy and want to get on to tokenizing, remember?). Line 1220 checks for the *FULL* condition. Then we "ripple up" all the text with larger line numbers to create a "hole" — done in 1230. Line 1240 does the insertion.

Deletion is similar — with a "ripple down" and the removal of the line # and text at the end.

LIST simply prints the line # and text — with a check for a keyboard entry between each line to allow a SPACE to halt the listing.

This Editor, being simple, won't take text after commas, and is susceptible to the other faults of the PET's INPUT statement.

To tokenize some text, each word is found by looking for blanks. Just as the PET sometimes includes a parenthesis in a token, like SPC(, the space after each word will be included in each token. (Even "I" will save a byte!). When text is unfolded, the added space will be replaced, and the text will be normal again. The codes for the tokens are made by looking at the position of the word in W$ and adding 128. For example, the token for ABOUT is CHR$(130).

Here is the rest of the program:

```
4000 PRINT"clr TOKENIZE TEXT"
4010 PRINT"dn dn HAVE, PATIENCE, I AM SLOW
      BUT SURE
4020 FOR J=1 TO 100:T$(J)="":NEXT
4030 PRINT"dn dn";
4040 TC=0:CS=0:CC=0
4050 FOR L=1 TO 100
4060 IF L%(L)=0 THEN 4170
4070 S$=S$(L)+" sp ":T$=""
4080 REM SCAN FOR TOKENS
4090 CC=CC+LEN(S$):X$=""
4100 FORJ+1TOLEN(S$):A$=MID$(S$,J,1)
4110 IF A$<>"sp" THEN X$=X$+A$:NEXT
4120 GOSUB 8000
4130 IF P=0 THEN X$=X$+"sp":T$=T$+X$:
      PRINT X$;:GOTO 4150
4135  TC=TC+1:CS=CS+LEN(W$(P))
4140 T=P+128:T$+T$+CHR$(T):PRINT"["
      MID$(STR$(T),2)"]";
4150 X$="": NEXT J
4160 T$(L)=T$:PRINT:NEXT L
4170 PRINT"dn dn FINISHED - PRESS KEY TO
      GO ON
4175 GETA$:IFA$=""THEN 4175
4180 PRINT"clr TOKENIZING REPORT
4190 PRINT"dn dn SOURCE IS"CC" CHARS LONG
4200 PRINT"FOUND"TC" TOKENS AND
4210 PRINT"SAVED "CS" CHARACTERS
4220 PRINT"RESULTS IN A ";
4230 PC=INT(CS/CC*10000)/100
4240 PRINT PC" sp % SAVINGS
4250 PRINT"dn dn PRESS KEY, ETC"
4260 GETA$:IFA$=""THEN 4260
4270 RETURN
5000 REM UNFOLD TEXT
5010 PRINT"clr UNTOKENIZED TEXT:
5020 PRINT"dn dn
5030 FOR L=1 TO 100
5040 IF L%(L)=0 THEN 5100
5050 T$=T$(L): FORJ=1 TO LEN(T$)
5060 A$=MID$(T$,J,1):A=ASC(A$)
5070 IF A<128 THEN PRINT A$;:GOTO 5090
5080 PRINT W$(A-128)"sp";
5090 NEXT:PRINT:NEXT
5100 PRINT"dn dn DONE - PRESS KEY, ETC
5110 GETA$:IFA$=""THEN 5110
5120 RETURN

8000 REM GIVEN X$, BINARY SEARCH W$
8010 TP=100: LP=1
8020 IF LP >TP THEN P=0: RETURN
8030 P=INT((TP+LP)/2)
8040 IF X$=W$(P) THEN RETURN
8050 IF X$>W$(P) THEN LP=P+1
8060 IF X$< W$(P) THEN TP=P-1
8070 GOTO 8020
```

To tokenize the text, the first step is to remove any junk in T$ from a previous pass — in Line 4020. Then some counters are set up in Line 4040. TC is the Tokens Count, CS is Characters Saved, and CC is Characters Counted. Lines 4050 and 4060 set up the L loop to look at each line of text. S$ is made the line of text with a space at the end — this permits words at the end of a line to be tokenized. In Line 4100 to 4110 we snatch characters and stuff them into X$ until a space is found. Subroutine 8000 searches for a token word match. A non-match adds X$ to the compressed string T$, in Line 4130, and a match builds a token in Line 4140. Line 4135 is a later addition which keeps the counters updated. Note that the compressed text is printed to the screen, with token numbers in brackets.

When all this is done, the string T$ is put into the T$() array — and then a brief report of the tokenizing effort is printed.

Decompressing the text is simpler — since tokens aren't normally printed characters, they are easily detected and the tokens looked up for display. Note that Line 5080 has to add the "sp" that is implied in every token.

Subroutine 8000 is an example of a Binary Search. Rather than looking through all 100 tokens in sequence, with an average search through 30 or more items (remember some are more common than others.), the tokens are arranged in alphabetical order. The search works like this:

PET, cont'd . . .

1) Set the top pointer to the top of the list.

2) Set the bottom pointer to the bottom. (Line 8010)

3) If top pointer is larger than the bottom pointer, the search failed. (Line 8020) Note: If P is left alone, it will indicate where the item would fit in for an insertion.

4) Select a test value midway between the top and bottom pointers. (Line 8030)

5) Quit if there is a match. (Line 8050)

6) If the List item is too small, move the bottompointer up to one past the test pointer (Line 8060). This halves the searching area.

7) And vice versa. (Line 8060)

8) Repeat by going to Step 3. (Line 8070)

If you can sort the items in a list, and the list is longer than about 20 items, a Binary Search is a faster method — especially for long lists. Save this code away for use in other programs. (You wouldn't **believe** how long it takes to debug these things!)

I tried a few text samples, and got these results:

First two Paragraphs of this Column:
25.15% savings
First Paragraph, ARTWEEK, 13 Oct 79
17.43% savings
Creative Computing's Ad for Wumpus
21.41% savings

I don't have space for a sample RUN of this program — try it out on your own. A more elaborate version would look at the text and compile a tokens table based on the frequency of words in the text itself.

A similar approach is to tokenize letter combinations (diagrams, trigrams, etc.), or to take note that some letters follow others with differing frequencies, and storing the transitions instead of the letters. A very useful article for the probability tables used for this appeared in: IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. PAMI-1, Number 2, April '79. See "n-Gram Statistics for Natural Language Understanding and Text Processing," Page 164.

As a last thought — if two-byte tokens were allowed, some 65,536 words could be compressed into two-byte values. A typical word has 4 characters plus the space — or about a 60% compression is possible. One might also consider 12 bit tokens, for 4096 words, and two tokens in 3 bytes. (And **Don't** mention Radix-41!) □

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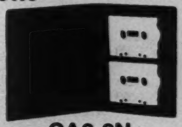
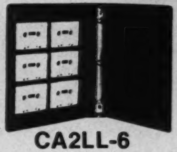


CA2-2N



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M-2

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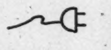
CIRCLE 183 ON READER SERVICE CARD

AC REMOTE CONTROL FROM YOUR COMPUTER



TRS-80 PET S100
APPLE KIM AIM65

INEXPENSIVE CONTROL SOLUTION FOR
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GREENHOUSES · ENVIRONMENTAL CONTROL
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CmC's μDAC system now includes an interface to the BSR X-10 remote control modules. These low-cost modules allow control over lamps, motors and appliances. With the CmC X-10 interface your computer can control 256 separate devices. Lamps can be turned on or off, dimmed or brightened. Alarms, kitchen appliances, hi-fis, TVs, motors, pumps, heaters and more can be put under your computer's control.

Direct plug-in and software for most computers.

Circle the reader service number, call or write for our latest catalog.

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TEL: (203) 775-9659 TWX: 710-456-0052

CIRCLE 133 ON READER SERVICE CARD

PET Word Processor

8K and 16/32K PET versions

C m C
SOFTWARE

This program permits composing and printing letters, flyers, advertisements, manuscripts, etc., using the COMMODORE PET and a printer.

Printing directives include line length, line spacing, left margin, centering and skip. Edit commands allow you to insert lines, delete lines, move lines and paragraphs, change strings, save files onto and load files from cassette (can be modified for disk), move up, move down, print and type.

Added features for the 16/32K version include string search for editing, keyboard entry during printing for letter salutations, justification, multiple printing and more.

A thirty page instruction manual is included.

The CmC Word Processor Program for the 8K PET is $29.50. The 16/32K version is $39.50.

Order direct or contact your local computer store.

VISA AND M/C ACCEPTED — SEND ACCOUNT NUMBER, EXPIRATION DATE AND SIGN ORDER. ADD $1 PER ORDER FOR SHIPPING & HANDLING — FOREIGN ORDERS ADD 10% FOR AIR POSTAGE

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BROOKFIELD, CONNECTICUT 06804
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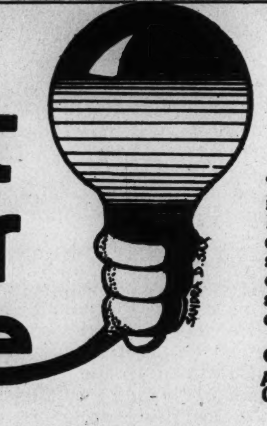
CIRCLE 133 ON READER SERVICE CARD

Compleat Computer Catalogue



We welcome entries from readers for the "Compleat Computer Catalogue" on any item related, even distantly, to computers. Please include the name of the item, a brief evaluative description, price, and complete source data. If it is an item you obtained over one year ago, please check with the source to make sure it is still available at the quoted price.

Send contributions to "The Compleat Computer Catalogue," *Creative Computing*, P.O. Box 789-M, Morristown, NJ 07960.

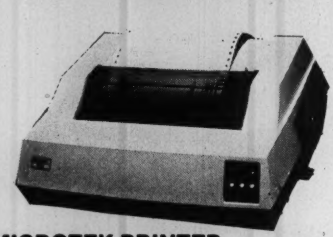
Terminals & I/O

PET PRINTER

Digiclocks has announced Microprinter 100 for the PET. It prints the entire screen character set in both regular and video reverse.

Digiclocks, 3016 Oceanview, Orange, CA 92665.

CIRCLE 209 ON READER SERVICE CARD



MICROTEK PRINTER

Microtek, Inc. has entered the under-$1,000 printer market with its MT-80 series, 125 character per second, 80- and 120-column bidirectional printer. The MT-80 series printer supports the full upper case and lower case 96-character ASCII set in three software selectable fonts on original plus three copies. The 10 CPI font uses 9x7 dot matrix.

The MT-80P Centronics-compatible parallel interface version is priced at $750. The MT-80S serial (RS-232) version is priced at $835.

Microtek, Inc., 7844 Convoy Ct., San Diego, CA 92111. (714) 278-0633.

CIRCLE 210 ON READER SERVICE CARD

LOW COST IMPACT PRINTER

Okidata announces a serial impact printer which has been developed to address the low cost printer market.

The Microline 80 operates at 80 CPS continuously with no duty cycle restrictions in either 5, 10 or 16.5 CPI formats utilizing a 9 x 7 character set. It will accommodate either standard 8½ inch roll paper or 3 part fanfold from 4.5 to 9.5 inches wide and will also produce block formatted graphics. Under $1000.

Okidata Corporation, 111 Gaither Dr., Mt. Laurel, NJ 08054. (609) 235-2600 ext. 25.

CIRCLE 211 ON READER SERVICE CARD

ADDRESSABLE PET PRINTER ADAPTER

CmC's ADA 1400 drives a printer with an RS-232 interface from the Commodore PET IEEE-488 bus. The ADA is addressable, works with the Commodore disk and prints upper and lower case ASCII.

A PET IEEE type port is provided for daisy-chaining other devices.

A cassette tape is included with programs for plot routines, data formatting and screen dumps. $179.00.

Connecticut microComputer, Inc., 150 Pocono Road, Brookfield, Connecticut 06804. (203) 775-9659.

CIRCLE 212 ON READER SERVICE CARD

VOICE I/O TERMINAL FOR SORCERER

Voicetek Inc. announces Cognivox, which plugs into Exidy's Sorcerer computer and offers a 16-word recognition vocabulary plus voice response with up to 16 words or phrases. Recognition accuracies of up to 98% are possible with cooperative speakers. The unit is self-contained in an attractive color coordinated cabinet and includes a microphone and amplifier/speaker making it a complete voice I/O terminal.

A software library, provided with Cognivox, includes Voicetrap, a voice operated video game and Vothello, a voice input version of the game Othello. $149.

Voicetek, P.O. Box 388, Goleta, CA 93017.

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6 galls. a full bath
Tub fits bather so 2 pails of water make full submergent bath. Hot bath made ready in 5 min. Wt., 10 lbs. Durable, compact, cheap. Cat. free, Baths or 15 styles FOLDING BOATS. Award at World's Fair. ACME FOLDING BOAT CO., MIAMISBURG, OHIO

Vendor Literature

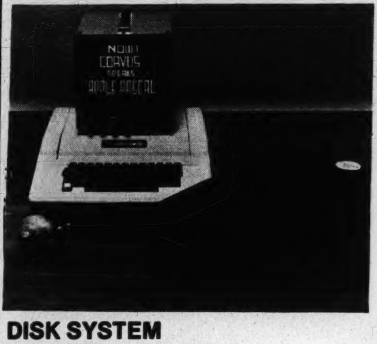
MICRO-COMPUTER ADD-ONS

Microcomputer Technology Inc., and Apparat Inc., distributors and developers of add-on hardware and systems software for the TRS-80 and other Micro-Computers have published a new catalog. The catalog is a reference guide to their line of mini-floppys, line printers, software, and other accessories for use with TRS-80 and other microcomputers.

Microcomputer Technology Inc., 2080 South Grand, Santa Ana, CA 92705. (714) 979-9923, or Apparat Inc., 7310 East Princeton, Denver, CO 80222. (303) 758-7275.

CIRCLE 214 ON READER SERVICE CARD

Disk Systems



DISK SYSTEM FOR APPLE PASCAL

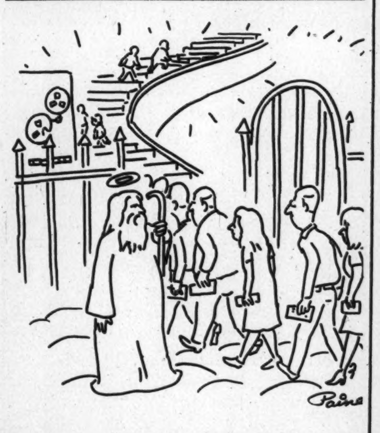
The Corvus disk system for Apple Pascal, designated the Model 11AP, is 100% compatible in all respects with Apple Pascal.

All of the following will run without modification: Apple Pascal disk operating system, the earlier Apple 3.2 disk operating system, any applications designed to run on the 280-block Apple floppy disks, and many new applications too large for Apple floppies.

To provide complete control over the data base with a high degree of operating flexibility and speed, Corvus has incorporated a new utility called dynamic volume management. This allows the ten-million byte data base to be used as a single large block or to be broken into any number of smaller blocks with the same management flexibility. $5350.

Corvus Systems, 900 S. Winchester, Suite #4, San Jose, CA 95128. (408) 246-0461

CIRCLE 215 ON READER SERVICE CARD



"All right, let's keep it moving - keep your punch cards handy for quick processing."

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Avoid "Forgotten" Passwords
Know how much space is available.
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CIRCLE 202 ON READER SERVICE CARD

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The **MAGiC WAND**™ Word Processing System offers you the best features of any system in the micro market

FEATURES INCLUDE:

Full-screen text editor
Simple, control key operation
Edit programs as well as text
Assemble, compile or run programs without modification
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Merge part or all of one file with another
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Print a file while editing another
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Simple commands set margins, page length, etc.
Override commands at run-time
Give any command from the keyboard as well as in file
Variable pitch control
Change pitch in mid-line, even mid-word
Up to 128 user-defined variables
String, numeric or dollar format
Form letter generation from external data files
Compatible with both sequential and fixed-record files
Conditional commands
Any command may be conditional
Print to disk and/or printer
Save all or part of output on disk
Switch from specialty printer to CP/M list device
Print the same file on either specialty or standard printer

EASE OF OPERATION

With all its power, the MAGIC WAND is remarkably easy to use. This is no accident. The command structure is designed to be flexible and logical so that you can perform basic functions with a minimum of commands.

We have included in the manual a step-by-step instructional program, for the person who has never used a word-processor before. The trainee uses sample files from the system disk and compares his work to simulated screens and printouts.

In addition to the lessons, the manual has a complete documentation of the command structure, special notes for programmers, an introduction to CP/M for non-programmers and a glossary. The manual is typeset, rather than typewritten, for greater legibility.

We have written the manual in non-technical English, because we want you to read it. We don't overload you with a bunch of jargon that could confuse even a PhD in Computer Sciences.

We send out newsletters so that users of the MAGIC WAND can learn special applications of the print commands. For example, we might show you how to create a mailing list or set up an index for a file.

In short, we've done everything we can to make things easy for you. Because the best software in the world is just a bunch of code if you can't use it.

For more information, call or write:
small business applications, inc.
3220 Louisiana • Suite 205 • Houston, Texas 77006 • 713-528-5158

CP/M is a registered trademark of Digital Research Corp

CIRCLE 186 ON READER SERVICE CARD

Computers

IPEX 8085 MICROCOMPUTER

IPEX International Inc. announces the IPEX 8085, a desk-top microcomputer which features built-in dual floppy disk storage.

The standard system includes approximately 600K bytes of on-line disk storage capacity which can be expanded to over 1.2 megabytes. Similarly, the standard 32K byte RAM can be expanded to 56K bytes directly without using memory management schemes.

The IPEX 8085 is supplied complete with a disk extended Basic package, disk operating system, and utilities software.

Other software which is supported on the IPEX 8085 includes CP/M, CBasic, Microsoft Basic, Fortran-80, a data base management package and applications programs which are compatible with these languages and operating systems. $3695.

IPEX International, 16140 Valerio St., Van Nuys, CA 91406. (213) 781-0020.

CIRCLE 216 ON READER SERVICE CARD

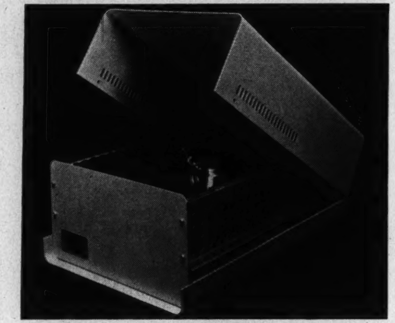
PRACTICE MANAGEMENT SYSTEM

Promedics Data Corporation, a medical and dental systems and consulting firm, has announced a practice management system for single producers, groups and clinics who desire to organize and manage their practices more successfully by greatly increasing the speed, accuracy and ease with which patient information can be processed.

The system consists of a practice management handbook which outlines the necessary procedures, personnel requirements, and forms to use; a central computer for processing the information; and the training and implementation required to convert the practice to the new system.

Promedics Data Corporation, 1032 Elwell Ct., Suite 240, Palo Alto, CA. 94303. (415) 961-2401

CIRCLE 217 ON READER SERVICE CARD



S-100 MAINFRAME

California Computer Systems has announced its new S-100 mainframe, a 12-slot, actively-terminated device designed for system builders.

The S-100 Mainframe, measuring 11⅝ inches high, 7 inches wide and 18 inches deep, comes complete with a fan and a circuit breaker. It supports output voltages of +8VDC at 20 amps and ±16VDC at 4 amps. Input may be 105, 115, or 125 VAC. The device is available in five colors: office cream, black, blue, brown and silver. $399.95

California Computer Systems, 309 Laurelwood Dr., Santa Clara, CA 95050.

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CIRCLE 130 ON READER SERVICE CARD

ANNOUNCING

TRS-80* PEOPLE'S PASCAL PROGRAM DEVELOPMENT SYSTEM

"Tiny" Pascal, runs on any 16K Level II system, includes the **programming structuring** capabilities of full Pascal, but not **data structuring.**

Compiled People's Pascal programs run about five-times faster than Level II Basic — graphics run eight-times faster. Tape 3 compiler written in Basic; tape 6 in machine language (FASTER).

People's Pascal Tape 3	**$15.00**
People's Pascal Tape 6	**$23.00**
Tape 1 Level II, 34 business, educational programs (Level I version, 24 programs—separate tape)	**$7.50**
Tape 2 Level II, 77 programs from Osborne book, "Some Common Basic Programs."	**$7.50**
Tape 4 Level I, business and educational	**$7.50**
Tape 5 Level II, business and educational	**$7.50**

Add 50¢ each tape for postage and handling. California residents add 6% tax. Dealer inquiries invited.

COMPUTER INFORMATION EXCHANGE
Box 158
San Luis Rey, CA 92063

CIRCLE 129 ON READER SERVICE CARD

Books and Booklets

BOARD RATES COMPUTER SCHOOLS

In a study of computer vocational training schools in New York State, the state Consumer Protection Board found that such schools offer a variety of training programs of varying quality and often promise much more than they deliver to eager young people who wish to compete in an overcrowded, slow-growing job market.

The study, entitled *Check It Out: A Comparative Guide To New York State's Computer Schools,* cited for quality of instruction 25 of the more than 230 programs at 118 schools statewide.

The 76-page guide defines and examines the four major computer job titles, data entry operator, computer operator, computer programmer and service technician, and compares the training offered by proprietary schools, Educational Opportunity Centers (EOCs), Board of Cooperative Education Services (BOCES), public school programs, and community colleges.

Single copies are available free from Computers, State Consumer Protection Board, Two World Trade Center, New York, NY 10047.

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BUYER'S GUIDE

A Buyer's Guide of microcomputer software, accessories and supplies listing releases of software and accessories for the Apple II and TRS-80 as well as a wide range of computer supplies is now available.

The Buyer's Guide sells for $3.00 but a certificate worth $3.00 off the first purchase is supplied with each copy.

Wallace Computers, Accessories and Supplies,Inc., 1024 West Willcox, Peoria, IL 61604 (309) 685-7876.

CIRCLE 219 ON READER SERVICE CARD

SUPERFLUOUS HAIR.

To remove hair—use a dissolver, or, better yet, use a razor. Both have the same effect.

To kill hair growth—investigate our common-sense, home treatment. Kills by absorption. Circular in plain, sealed envelope, on application.

THE HONOGRAM CO., 107 Pearl St., New York.

GUIDES TO WORD PROCESSING

Practical Guides to Word Processing, the first in a series of books dedicated to the subjects of word processing concepts and hardware implementation has been introduced by Information Management Corporation.

The individual, step-by-step guides to implementing word processing equipment and hardware are written for anyone involved in investigating, implementing and/or managing word processing systems and concepts.

Information Management Corporation, 4319 Covington Hwy., Suite 320, Decatur, GA. 30035. (404) 289-5620

CIRCLE 220 ON READER SERVICE CARD

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- 4K BANK ADDRESSABLE
- EXTENDED MEMORY MANAGEMENT
- NO DMA RESTRICTIONS
- ASSEMBLED & TESTED

2MHZ $250 - 4MHZ $265

MICROBYTE 32K RAM BOARD

- FULLY S-100 COMPATIBLE
- USES LO-PWR 4KX1, MM5257's
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78H05	4.75
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LM348	1.00	.92	.85
LM377	1.10	1.00	.95
LM380	.80	.75	.70
LM3900	.55	.50	.44
DM8216	2.10	2.00	1.90
8080A	4.50	4.25	4.00
8251	5.00	4.80	4.50

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SUPERPASCAL

5-10 times faster...
and more!

Meet Pascal/Z,™ the fast, flexible compiler with higher speed, greater efficiency and improved debugging.

- **True Z-80 native code Pascal compiler**—5-10X faster than competing P-code implementations—*no interpreter required.*
- **The only multi-tasking Pascal**—produces ROMable re-entrant code.
- **Optimized** for fastest execution—recognizes and exploits special cases.
- **Easily transportable**—all hooks to your system made through support library.
- **Includes standard** floating point package. Single copy on CP/M-compatible disk includes: compiler, companion macro-assembler & source of the library, $395. OEM licenses available. Write or call for more information.

InterSystems™

Ithaca Intersystems Inc., 1650 Hanshaw Road/P.O. Box 91,
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CIRCLE 147 ON READER SERVICE CARD

The
Self-Indexing
Query System

WHATSIT?™

Wow! How'd All That Stuff get In There?

Computer Headware

BOX 14694
SAN FRANCISCO 94114

Software

BUSINESS

National Software Marketing, Inc., announces the release of an **apartment and rental unit management system** for the TRS-80 which can be used with either tape or disk systems, with or without a printer. $99. National Software Marketing, Inc., Box 6195, Hollywood, FL 33021.

CIRCLE 221 ON READER SERVICE CARD

Micro-Ap offers **GLector,** a general ledger system to run with their Selector III-C2 Information Management System. The system uses transaction codes for data entry, thereby eliminating the need to memorize account numbers. It requires a 52K CP/M operating system, CBasic Version 2 and Selector III-C2. $250. Micro-Ap, 9807 Davona Dr., San Ramon, CA 94583.

CIRCLE 222 ON READER SERVICE CARD

Payroll Processing, Inventory Control/Order Entry and Accounts Receivable/Invoice Entry are three software packages designed to extend the range of applications for the Chieftain small business computer system. Smoke Signal Broadcasting, 31336 Via Colinas, Westlake Village, CA 91361. (213) 889-9340.

CIRCLE 223 ON READER SERVICE CARD

A fully **CP/M compatible operating system** for the TRS-80 Model II computer has been announced by MPU. The system requires no changes in the operating codes to work with CBasic and other CP/M programs. $249.95. MPU, P.O. Box 808, San Carlos, CA 94070. (800) 824-7888; in California, (800) 852-7777.

CIRCLE 224 ON READER SERVICE CARD

A **Business and Financial Analysis** program includes portfolio, home ownership, yield to maturity, ROI, economic order quantity and 28 other common business problems, all of which are handled in a single input/output format. The program is available for the TRS-80, Level II; CP/M or Kansas City. $36. Microcomputer Applications, Inc., 4614 Trail Crest Cir., Austin, TX 78735. (512) 892-0156.

CIRCLE 225 ON READER SERVICE CARD

Arkansas Systems announces integrated **Order Entry, Accounts Receivable** and **Inventory** systems for wholesale and manufacturing companies. The systems are written in Fortran and provided on CP/M compatible disks. Arkansas Systems, Inc., 8901 Kanis Rd., Suite 206, Little Rock, AR 72205. (501) 227-8471.

CIRCLE 226 ON READER SERVICE CARD

Earned Income Payroll Software from California Business Computers can handle full measure payroll activities for firms up to 80 employees. The package includes the new Earned Income Credit Provisions required in July 1980, plus federal and state tax tables. The program will run on micro computers that use the CP/M disk operating system, CBasic or CBasic2. $595. California Business Computers Corporation, 825 W. Hamilton Ave., Campbell, CA 95008.

CIRCLE 227 ON READER SERVICE CARD

Acct-III consists of three programs that carry out the on-line accounts receivable functions of a small business or medical clinic. It requires a dual disk, 32K min. DOS TRS-80 system. $69. Micro Architect, 96 Dothan St., Arlington, MA 02174.

CIRCLE 228 ON READER SERVICE CARD

A-T Enterprises has announced software designed to provide **management and accounting control for income properties.** The software is written in CBasic and runs under the CP/M operating system. $750. A-T Enterprises, 221 N. Lois St., La Habra, CA. (213) 947-2762.

CIRCLE 229 ON READER SERVICE CARD

Data Train has announced a line of accounting program products called the DTI **Bookkeeper II,** designed around Microsoft Stand Alone Basic. Bookkeeper II provides ledger report writer modules for general ledger, accounts receivable, accounts payable, and fixed asset accounting. $159 to $900 per module. Also available is Payroll for a dual minidisk, 32K, TRS-80 business system. $235. Data Train, Inc., 840 N.W. 6th St., Suite 3, Grants Pass, OR 97526. (503) 476-1467.

CIRCLE 230 ON READER SERVICE CARD

WORD PROCESSING

Master Text Processer for the Apple II and Apple II Plus is a Basic system which includes its own mailing list element and a programmable form letter writer. It will operate on 32K with either one or two disk drives. $139.95. Charles Mann & Associates, Micro Software Division, 7594 San Remo Tr., Yucca Valley, CA 92284. (714) 365-9718.

CIRCLE 231 ON READER SERVICE CARD

Pencil/Pal enables users of the TRS-80 and Electric Pencil to merge the body of a letter with a file of names and addresses. $35. MicroComputer Specialists, P.O. Box 11295, Elkins Park, PA 19117. (215) 635-2473.

CIRCLE 232 ON READER SERVICE CARD

Pro-Type, on CP/M compatible 8" single density disk, features text editing and formatted printing in a single, compact program. The program is compatible with any kind of input terminal and any printer interfaced to the disk operating system. $75. Interactive Microware, Inc., P.O. Box 771, State College, PA 16801. (814) 238-8294.

CIRCLE 233 ON READER SERVICE CARD

Super-Text, a word processing system for the Apple II and Apple II Plus, features a multiple paging system which allows the user to view two text screens simultaneously, keeping notes or instructions on one screen while editing the other. It also has built-in floating point math and automatic tabbing to facilitate the preparation of manual reports. $99.95. Muse Co., 7112 Darlington Dr., Baltimore, MD 21234. (301) 661-8531.

CIRCLE 234 ON READER SERVICE CARD

The **Magic Wand,** a word processing system for 8080, Z80 and 8085 based computers, uses the CP/M operating system and consists of a text editor and print processor. Small Business Applications, Inc., 3220 Louisiana, Suite 205, Houston, TX 77006. (713) 528-5158.

CIRCLE 235 ON READER SERVICE CARD

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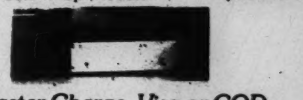
CIRCLE 136 ON READER SERVICE CARD

New From ECI

- **Selectric I/O Interface Controller**—For IBM Selectric I/O typewriters. Uses standard parallel port driver. Automatic case control. (Some typewriter modification may be required.) Less connectors. With full instructions. **$289.00**
- **Cassette to Parallel Converter**—Use with Selectric I/O interface to run a typewriter or other parallel device from your cassette output. Works with T-BUG or similar monitor program. Software listing supplied. **$69.95**
- **AGC Box**—Provides constant cassette output regardless of tape level. End loading error problems. Includes tape deck control switch and data indicator. **$29.95**
  Dual unit for two recorders. **$39.95**
- **I.C. Tester**—Tests most common TTL and CMOS I.C.'s. Convenient bench-top module. **$199.95**



SC-5 Typewriter Controller

***Will accept:** Master Charge, Visa or COD*

ECI

ELECTRO CONTROLS INC.
6951 Southgate, San Diego, CA 92119

CIRCLE 139 ON READER SERVICE CARD

GB Associates has released a cassette-based **word processor** for the TRS-80, Level II, which is compatible with the Radio Shack Line Printer II and Centronics 730. $19.95. GB Associates, P.O. Box 3322, Granada Hills, CA 91344.

CIRCLE 236 ON READER SERVICE CARD

RECREATION AND GAMES

NSP Computer Services announces an interactive **Bowling** game for use on TRS-80 and Apple II Computers. $9.95. Also included in the announcement is a Golf Handicap System to compute and record golf scores and handicaps on the TRS-80 or Apple II. $85. NPS, Inc., P.O. Box 3092, Crofton, MD 21114. (301) 721-3849.

CIRCLE 237 ON READER SERVICE CARD

Checker King from Personal Software plays at eight levels of skill selected by the user and changeable during the game. It is available on cassette for Apple II, Apple II Plus, TRS-80 Level I and II and Commodore's PET and CBM computers. **Gammon Gambler** plays at any of ten levels of difficulty. It is available on cassette for PET, CBM and Apple II. $19.95 each. Personal Software, Inc., 592 Weddell Dr., Sunnyvale, CA 94086. (408) 738-3096.

CIRCLE 238 ON READER SERVICE CARD

Dungeon Explorer for the TRS-80 Level II is a single player game of adventure and combat based on Dungeons and Dragons. $8.50. Software Exchange, 2681 Peterboro, W. Bloomfield, MI 48033.

CIRCLE 239 ON READER SERVICE CARD

IMAGE
IMAGE
IMAGE COMPUTER PRODUCTS
IMAGE COMPUTER PRODUCTS
IMAGE COMPUTER PRODUCTS
IMAGE COMPUTER PRODUCTS

Image Computer Products has announced a line of **personal computer software** for the Atari 400 and 800 and the Texas Instruments 99/4. The programs available include: All Star Baseball, Wall Street Challenge, Mind Master, Strategy Pack I and II, Skill Builder, Tournament Brick Bat, and Wildcatting. Image Computer Products, Inc., 615 Academy Dr., Northbrook, IL 60062.

CIRCLE 240 ON READER SERVICE CARD

Interactive Microwave has introduced four new recreational programs for the TRS-80: In **Mirrorays** the user flashes rays of light into a black box in order to locate hidden mirrors. **Compact Graphics Interpreter** creates elaborate graphic designs with a simple set of numbers. **Lunar Lander Simulator** provides real-time simulation and control of a lunar module. **Battlegrid** is a real-time game of speed and strategy in which two players attack one another's forces. $7.95 each. Interactive Microware, Inc., P.O. Box 771, State College, PA 16801. (814) 238-8294.

CIRCLE 241 ON READER SERVICE CARD

LANGUAGES

The Software Farm announces **tinyForth** 2.1, a high level structured language designed for TRS-80 computers. $29.95. The Software Farm, P.O., Box 2304, Reston, VA 22090. (703) 437-9218.

Basex Compiler is a language that runs up to 20 times faster than Basic. Features include arrays, strings, 16 bit math, block move and search, subroutines with multiple arguments, fast graphics and tape I/O. $25. Interactive Microware, P.O. Box 771, State College, PA 16801. (814) 238-8294.

CIRCLE 242 ON READER SERVICE CARD

STOCK MARKET ANALYSIS PROGRAM
DJI WEEKLY AVERAGE 1897-1980

ANA1* (ANALYSIS 1) is a set of BASIC Programs which enables the user to perform analyses on the Dow Jones Industrial weekly average data. From 6 months to 5 years of user selected DJI data can be plotted on the entire screen in one of 5 colors using Apples' High Resolution capabilities. The DJI data can be transformed into different colored graphic representations called transforms. They are: user specified moving averages; a least squares linear fit (best straight line); filters for time, magnitude, or percentage changes; and user created relationships between the DJI data, a transform, or a constant using +,-,x,/ operators. Colored lines can be drawn between graphic points. Graphic data values or their dates of occurrence can be displayed in text on the screen. Any graph or text can be outputted to a users printer. The Grid Scale is automatically set to the range of the graphs or can be user changed. As many colored graphs as wanted can be plotted on the screen and cleared at any time. The user can code routines to operate on the DJI/transform data or create his own disk file data base. ANA1 commands can be used with his routines or data base. An Update program allows the user to easily update the DJI file with current DJI weekly data.

The ANA1 two letter user commands are: CA = Calculate, no graph. CG = Clear Graphs, leave Grids. CK = Checking out program, known data. CO = Color of next graph (red, green, violet, white, blue). CS = Clear Screen. DL = Draw Line between points. FI = Filter data for time, magnitude, or percent change. FU = Data, transform, or constant Function with +,-,x,/ operator. GD = Graphic mode, display all Graph Data on screen. GR = Graph data to screen. GS = Set Grid Scale. HE = Help, summary of any commands usage. LD = Load Data from disk file from inputted date to memory. LG = Leave Graphs, automatic Grid rescaling. LO = Look, select a range of the LD data and GR; All commands can now be used on this range. LS = Least squares linear fit of the data. MA = Moving Average of the data. NS = No Scale, next graph on screen does not use Grid Scale. NT = No Trace. PR = User implimented Printer routine. TD = Text mode, display Text Data on screen. TI = Time number to date or vice versa. TR = Trace. TS = Text Stop for number of lines outputted to screen when in TD. U1/U2 = User 1/2 implimented routines. VD = Values of Data outputted in text. VG = Values of Grid; low/high/delta. VT = Values of Transform outputted in text.

APPLE® II, 48 K, APPLESOFT
ROM CARD, DISK II DOS 3.2
ANA1 DISK & MANUAL . . . $49.95
(CA residents add 6% sales tax)

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P.O. BOX 22072
SAN DIEGO, CA 92122

* Software Review in Call-A.P.P.L.E. (2/80): "An example of an excellent piece of software exploiting most of Apple II's major features." Overall Rating = 92.1

CIRCLE 141 ON READER SERVICE CARD

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For The TRS-80*

TAX PROGRAM BOOK

Many Tax Programs — Helpful Programming Hints for Newcomers — and How to Handle Your Own TRS-80, Taxwise.

The book that lets you program your own Income Taxes. Includes Form 1040A, Form 1040, Schedules A, B, C, D, E, F, G, R and SE, Form 2210, Investment Credit, Minimum Tax, Maximum Tax, Depreciation, 10-Year Averaging and others.

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*TRS-80 is T.M. Reg. Tandy Corp., Ft. Worth, TX 76102

CIRCLE 142 ON READER SERVICE CARD

SYSTEMS

USER'S MANUAL
Z80 Based Software Development System for the Sorcerer Computer
DEVELOPMENT PAC
ROM PAC
$99

Exidy Data Systems has announced **Development Pac,** a plug-in ROM Pac cartridge for the home computer user who wants to develop machine-language programs and systems. The manufacturer says that the software can turn a Sorcerer into a "relatively sophisticated, cassette-based Z-80 development system." $99. Exidy Data Systems, Sunnyvale, CA.

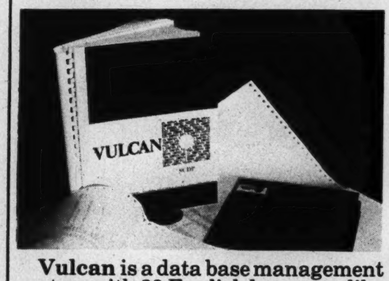
CIRCLE 243 ON READER SERVICE CARD

Cosapple is an 1802 simulator and debug package designed to run on the Apple II. It enables the Apple to run programs coded in 1802 machine language and can be used as a development aid. $20. Dann McCreary, Box 16435-C, San Diego, CA 92116. (714) 281-5758.

CIRCLE 244 ON READER SERVICE CARD

Micropolis Corporation has announced the development of a **multi-user operating system** for the Micropolis MicroDisk. The manufacturer says that "with the MicroDisk operating system, users can plug in a primary storage device with performance characteristics equal to or surpassing those available on many minicomputer systems costing two to four times more." $5,000. Micropolis Corporation, 7959 Deering Ave., Canoga Park, CA 91304. (213) 703-1121.

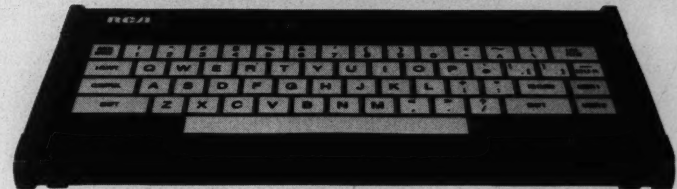
CIRCLE 245 ON READER SERVICE CARD



Vulcan is a data base management system with 38 English language-like commands to manipulate files, records, fields and scratch-pad variables. It is written in 8080 assembly language and operates on 8080 or Z80 systems under CP/M or PTDOS. $490. Software Consultation, Design and Production, 6542 Greeley St., Tujunga, CA 91042. (213) 352-7701.

CIRCLE 292 ON READER SERVICE CARD

ASCII encoded keyboards as low as $65.*



The RCA VP-601 keyboard has a 58 key typewriter format for alphanumeric entry. The VP-611 ($15 additional*) offers the same typewriter format plus an additional 16 key calculator type keypad.

Both keyboards feature modern flexible membrane key switches with contact life rated at greater than 5 million operations, plus two key rollover circuitry.

A finger positioning overlay combined with light positive activation key pressure gives good operator "feel", and an on-board tone generator gives aural key press feedback.

The unitized keyboard surface is spillproof and dustproof. This plus the high noise immunity of CMOS circuitry makes the VP-601 and VP-611 particularly suited for use in hostile environments.

The keyboards operate from a single 5-volt, DC power supply, and the buffered output is TTL compatible. For more information contact RCA Customer Service, New Holland Avenue, Lancaster, PA 17604.

Or call our toll-free number: 800-233-0094.

RCA

*OEM price.

CIRCLE 179 ON READER SERVICE CARD

IMAGINE .... 193 GAMES FOR YOUR CP/M SYSTEM

OUR BEST ACTION, STRATEGY AND FANTASY GAMES

Creative Computing Software should be stocked by your local computer store. If your favorite retailer does not have the software you need have him call our retail marketing department. Or you can order directly from Creative Computing, at 800/631-8112, with your bankcard number. In NJ 201/540-0445. Our mail order address is P.O. Box 789-M. Morristown NJ 07960.

ADVENTURE Original Aventure. You'll search perilous underground caverns for enchanted treasures. Bilingual: English/French. ($24.95 CS-9004). **Adventureland and Pirate Adventure.** Two fantastic adventures. You'll meet up with WILD ANIMALS, MAGICAL BEINGS, and the PIRATE himself. ($24.95 CS-9003).

BASIC GAMES($24.95 each) 1.51 action and strategy games including Depth Charge, Hammurabi, and Football (CS-9001). 2. 51 more fun and challenging games featuring Lunar Lander, Stock Market, and Super Star Trek (CS-9002). 3. 50 programs for games freaks including Close Encounters, Grand Prix, and Life Expectancy (CS-9005). 4. Hours of Diversion: 38 games with Mastermind, and Yahtzee (CS-9006). Basic Games Disks require 48K and Microsoft Basic.

creative computing software

sensational software

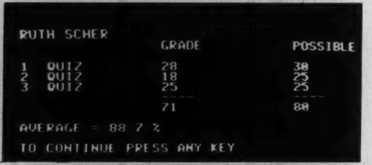
A Codasyl-compatible database management system for microcomputers has been announced by Microsoft. **Micro-Seed** runs under CP/M with Fortran-80 as the host language.

It uses the Codasyl schema, subschema and area methods to divide and define the data base, providing easy access from the user programs. $900.

Microsoft, 10800 Northeast 8th, Suite 819, Bellevue, WA 98004. (206) 455-8080.

CIRCLE 246 ON READER SERVICE CARD

EDUCATIONAL



```
RUTH SCHER
                    GRADE               POSSIBLE

1  QUIZ             28                  30
2  QUIZ             18                  25
3  QUIZ             25                  25
                    ----                ----
                    71                  80

AVERAGE = 88.7 %

TO CONTINUE PRESS ANY KEY
```

Computer Chemistry for the Apple II is a series of 15 CAI high school chemistry programs in Basic. The **Apple Grade Book** program records any type of student grade along with the type of grade and/or the date on a separate file for each class. $19.50 each. J & S Software, 140 Reid Ave., Port Washington, NY 11050.

CIRCLE 247 ON READER SERVICE CARD

UTILITIES AND MISCELLANEOUS

Cottage Software announces **Packer,** an editing tool for the TRS-80 Level II or Disk Basic, allows the user to save memory and time by packing a Basic program. It is written in machine language and is supplied on two tape cassettes in three versions, one each for 16K, 32K and 48K. $29.95. Cottage Software, 614 N. Harding, Wichita, KS 67208.

CIRCLE 248 ON READER SERVICE CARD

The Verifier from Wolf & Associates is designed to eliminate TRS-80 cassette problems. It tells the user in real-time the correct volume level to use to load pre-recorded program tape and to playback recordings. It will also certify blank cassettes by writing a special data pattern and then reading it back to see if any bits have been dropped. $14.95. Wolf & Associates, P.O. 8073, La Crescente, CA 91214.

CIRCLE 249 ON READER SERVICE CARD

ABS Suppliers has introduced a utility, **B-17 1700 Baud Loader,** for the TRS-80 Level II tape system which allows loading, saving and verifying Basic or system programs three times faster than normal. ABS Suppliers, P.O. Box 8297, Ann Arbor, MI 48107.

CIRCLE 250 ON READER SERVICE CARD

The **Keyword Indexing** package is a series of programs that enables the TRS-80 user to create a disk file, build an index of all occurrences of keywords, and inquire into that file using any combination of keywords. The package requires two disks and 32K of memory. $39.95. Northeast Microware, P.O. Box 6153, Syracuse, NY 13217.

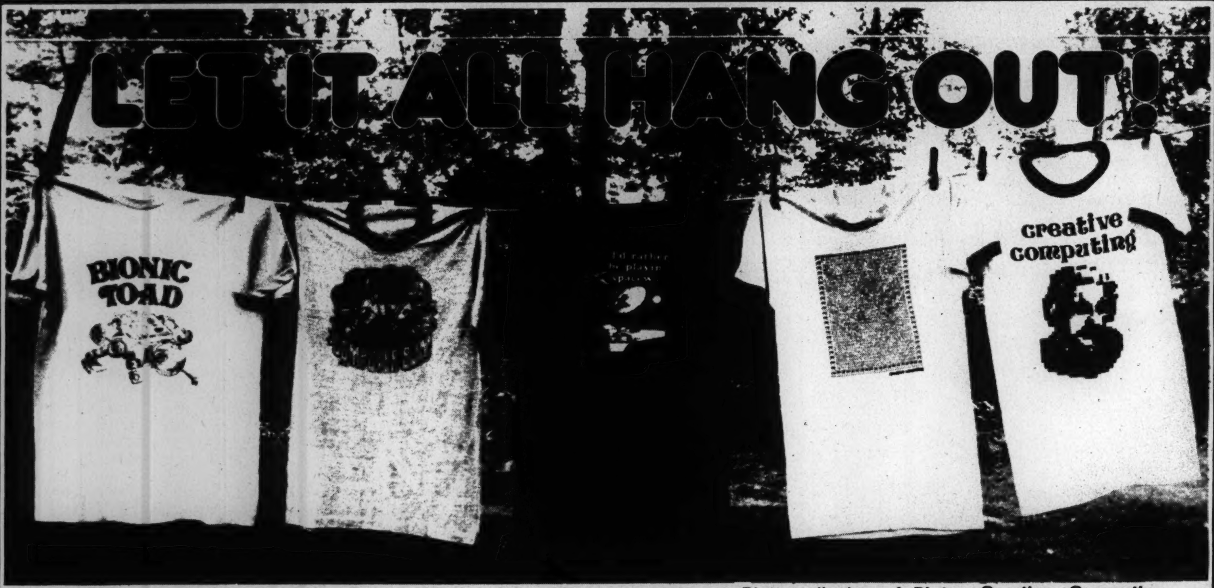
CIRCLE 251 ON READER SERVICE CARD

Ecosoft has released an advanced statistical package called **Microstat** for serious scientific, research and business applications. Designed for use with the North Star Disk Operating System and Basic, the program uses a data management subsystem to control, edit and modify all files that are used as data input into the system. $10. Ecosoft, P. O. Box 68602, Indianapolis, IN 46260. (317) 253-6828.,

CIRCLE 252 ON READER SERVICE CARD

Memdoc is a user interactive memory diagnostic for 8080, 8085 and Z80 systems. Written in assembly language on North Star diskette, it is intended to be used by both the technician who repairs memory systems, and by the general user who wishes to qualify memory periodically. $34.95. Eagles Computer Works, P.O. Box 22664. Denver, CO 80222. (303) 756-4052.

CIRCLE 253 ON READER SERVICE CARD



Creative's own outrageous **Bionic Toad** in dark blue on a light blue shirt for kids and adults.

Computer Bum — black design by cartoonist Monte Wolverton on gray denim-look skirt with black neckband and cuffs.

I'd rather be playing spacewars — black with white spaceships and lettering.

Plotter display of **Pi to 625 Places** in dark brown on a tan shirt.

Creative Computing — Albert Einstein in black on a red denim-look shirt with red neckband and cuffs.

T-shirts available in adult sizes S, M, L, XL; and in children's sizes (Bionic Toad and Spacewar) S, M, L. When ordering, specify design and size. Made in USA. $5.00 postpaid in USA; $6.00 postpaid, foreign.

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creative computing

A new version of the Datacope **Single Disk Sort,** a machine-language disk-file sorting program for Apple II and Apple II Plus, organizes a text file into any alphabetical or numerical order at high speed. $49.95. Datacope, P.O. Box 55053, Hillcrest Station, Little Rock, AR 72205.

CIRCLE 293 ON READER SERVICE CARD

IBM2CPM is an IBM to CP/M or CP/M to IBM transfer utility program which allows the user to transfer a source program or hex file to a micro via a standard 8″ floppy disk. $95. Precision Computer Systems, Inc., 1737 North First St., San Jose, CA 95112.

CIRCLE 254 ON READER SERVICE CARD

Disco-Tech's **DDT,** a disk drive timing program for TRS-80 and Apple II computers allows the user to keep track of and adjust disk drive motor speed. It provides a real-time graphic display of the motor speed on the video screen. $19.95. Also available for the TRS-80 Level II and Disk Basic is Machine Language **Utility Package No. 1** which is said to eliminate "keybounce," perform a formatted input routine, permit upward and downward scrolling, and provide insert and delete options. Disco-Tech, P.O. Box 11129, Santa Rosa, CA 95406.

CIRCLE 255 ON READER SERVICE CARD

Computer Headware has issued **Release 2,** an update of its Model A-1 "Whatsit" brand self-indexing query system for the Apple. Responding to "pidgin English" requests, Whatsit answers direct questions at conversational speed by cross-referencing data entries in disk storage. A Release 1 disk may be exchanged for Release 2 upon payment of a copying charge. Computer Headware, P.O. Box 14694, San Francisco, CA 94114.

CIRCLE 256 ON READER SERVICE CARD

Perry's **Auto Apple** for the Apple II or Apple II Plus programs boots and auto loads from tape or disk, when used with DOS. It displays the free sectors available and the option to catalog up to three drives at one time. $39. Perry's Computer Systems, 133 Brenda St., Milton, FL 32570. (904) 994-8251.

CIRCLE 257 ON READER SERVICE CARD

Apple Barrel Bushel #1 is a collection of 25 programs, including Mortgage Loan, Days Between Dates, Calendar, Checkbook, Metric Conversion, Addition, Apple LeMans, Plot, Menu Utility, Screen Print and Music Utility. $29.95. Computer Data Systems Corp., 550 North Main St., Logan, UT 84321. (801) 753-6990.

CIRCLE 258 ON READER SERVICE CARD

Dakin5 **Programming Aids** is a menu-driven utility package for use on the Apple II. It displays or prints all or selected records from a text file, copies a text file from one diskette to another, performs diskette-to-diskette copy with verification that output matches input, and includes a powerful data entry subroutine. $39.95. Dakin5 Corporation, P.O. Box 21187, Denver, CO 80221.

CIRCLE 259 ON READER SERVICE CARD

Desktop/Plan for the Apple II allows a business person to develop and operate customized business planning and analysis systems with no programming knowledge. It allows the user to decribe reports and calculation requirements in terminology familiar to most business people. $95. Desktop Computers, Inc., 5276 Hollister Ave., Santa Barbara, CA 93111.

CIRCLE 260 ON READER SERVICE CARD

The Applesoft **Tape Verifier** from Softsell Associates, provides the Apple II or Apple II Plus with the ability to verify programs saved to cassette. The program remains resident in the computer as long as power is applied and the computer is in the Applesoft mode. $20. Softsell Associates, 2022 79th St., Brooklyn, NY 11214.

CIRCLE 261 ON READER SERVICE CARD

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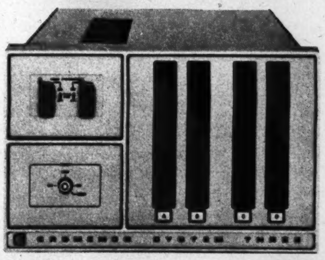

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CIRCLE 152 ON READER SERVICE CARD

Z-80/TRS-80™ Users
BOOK YOU'VE WANTED NOW CAN BE YOURS
THE Z-80: HOW IT WORKS
(THE PROGRAMMERS PERSPECTIVE)
By Monte Corum
Best Most Complete Reference Yet
cpu Operation Explained
Addressing Modes Demystified
Register Functions Described
Instructions Defined
Interrupts Diagrammed
Cycles Outlined Formats Described
Execution Described in Text,
Notation and Diagrams
Meaningful Analysis of 698 Commands
in Formatted, Usable Tables
Simple, Consistent Notation and Formats
A Programmer's Book, Beginner or Experienced
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™ TRS-80 IS A TRADEMARK OF TANDY CORP.

CIRCLE 161 ON READER SERVICE CARD

Miscellaneous

MicroGnome's CAIware is a software system for authoring and using Computer Assisted Instruction on the 16K TRS-80 Level II. The system guides and prompts the author with a set of well-defined prototype questions. $24.95. Fireside Computing, Inc., 5843 Montgomery Rd., Elkridge, MD 21227. (301) 796-4165.

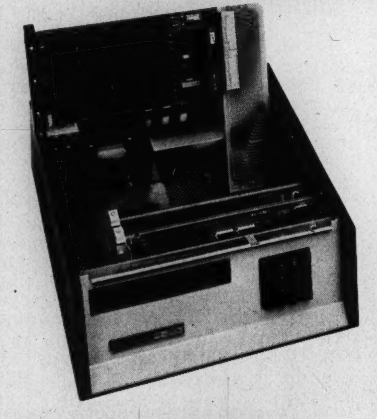
CIRCLE 262 ON READER SERVICE CARD

Text*Type is a utility program for the Apple that includes nine distinct character sets plus six combinations and allows the user to review all the characters sets and append them automatically to Applesoft programs. It requires a 48K Apple and a disk drive. Computer Solutions, Personal Information Products, 5135 Fredericksburg Rd., San Antonio, TX 78229. (512) 341-8851.

CIRCLE 263 ON READER SERVICE CARD

Sortmaster from Creative Computer Consultants contains listings of five Basic subroutines designed to sort numeric data in memory. The program also includes a self-contained introduction to basic sorting concepts. It is designed for us with TRS-80, PET and Apple. $8.95. Creative Computer Consultants, P.O. Box 2111, Norwalk, CT 06852. (203) 847-0141.

CIRCLE 264 ON READER SERVICE CARD

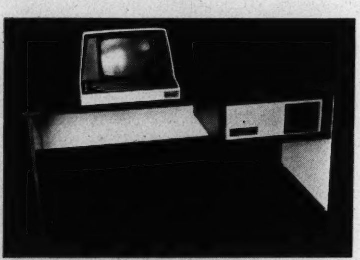


H8 EXTENDER BOARD KIT

The H8 Extender Board, available in a ready to assemble kit, allows HeathKit owners to troubleshoot their machines faster and more easily, because each board is up above the computer for complete access to all circuits and components. Jumper links in power lines make power measurement simple. In addition, the links can be replaced with fine copper wire, which will protect the traces of the motherboard from damage due to excessive current during testing. $39.00.

Mullen Computer Products, Inc., Box 6214, Hayward, CA 94545. (415) 783-2866

CIRCLE 265 ON READER SERVICE CARD



MODULAR DESK UNITS

Computer Plus offers a modular executive desk line. All units have a 60"x30" desk top, height 27", walnut formica with white accents, foot levelers, weight braces and modesty skirt. $190.00.

Computer Plus+Inc., 15 Mare Lane, New Milford, CT. 06776. (203) 354-0167.

CIRCLE 266 ON READER SERVICE CARD

CP/M 2.0

Expand the horizons of your TRS-80 model II with the industry standard operating system, CP/M version 2.0, and get these advantages over TRSDOS:

- compatible with hundreds of **existing** software packages
- **wide choice** of programming languages: BASIC, PASCAL, FORTRAN, COBOL, C, ASSEMBLER, and others
- **faster** disk access
- **more storage** per diskette
- assembler, editor, file handler, and dynamic debugger **included** with the operating system

TRS-80 MOD II

Introductory price: $175 including manuals

For full details about how CP/M 2.0 can improve the performance of your TRS-80 model II, contact:

PICKLES & TROUT

PICKLES & TROUT
P.O. BOX 1206, GOLETA, CA 93017, (805) 967-9563

CP/M is a trademark of Digital Research Inc. TRS-80 is a trademark of Tandy Corp.

CIRCLE 172 ON READER SERVICE CARD

****** 6800/6809 SOFTWARE ******

ACCOUNTS PAYABLE #1300 PRODUCE FINANCIAL REPORTS, PRINT CHECKS, SPECIAL CONTROL LETTER. REPORTS BY VENDOR NUMBER, INVOICE NUMBER, AGED AND HISTORY FILE. AUTO SORTING OF VENDOR AND INVOICE FILES. PLUS CHECK AND PRE CHECK JOURNALS.	$600.00
ACCOUNTS RECEIVABLE #1500 PRODUCES FINANCIAL REPORTS, PRINTS STATEMENTS, PRODUCES REPORTS BY CUSTOMER ACCOUNT NUMBER, INVOICE BY CUSTOMER ACCOUNT NUMBER AND INVOICE BY INVOICE NUMBER. PRINT AGED REPORT AND TRIAL BALANCE. KEEPS HISTORY FILE AND AUTO SORTING OF FILES.	$600.00
GENERAL LEDGER #100 PROGRAM UPDATES TO LEDGER FILES AND ALSO GENERATES REPORTS ON PAYROLL, SALES, ACCOUNTS PAYABLE, CASH AND EXPENSE STATISTICS. BALANCE SHEET AND PROFIT & LOSS REPORTS. INFORMATION CAN BE GENERATED FOR YEAR END TAXES, 941 AND W2 FORMS.	$595.00
INVENTORY I, #600 INVENTORY FOR A SMALL COMPANY. PRODUCES ACTIVITY REPORTS FOR DAY, MONTH AND YEAR. MINIMUM QUANTITY SEARCH. INVENTORY LIST BY CLASS, BY VENDOR OR COMPLETE WITH TOTALS AND FINANCIAL REPORT.	$100.00
INVENTORY II, #700 PRODUCE INVENTORY REPORTS BY DESCRIPTION OR VENDOR, PRINT ACTIVITY REPORTS FOR ONE DAY, ONE MONTH OR ONE YEAR. QUICK SEARCH BY PART NUMBER, PRODUCE TOTAL INVENTORY AND FINANCIAL REPORT. (FOR ONE STORE)	$200.00
INVENTORY III, #800 SAME AS INVENTORY II, #700, BUT PRODUCES REPORTS FOR EIGHT STORES.	$300.00
SHIPPING/RECEIVING PRODUCE YOUR BUSINESS FINANCIAL REPORT, PRODUCE REPORTS ON SALES, ACCOUNTS RECEIVABLE AND LAST PURCHASE BY CUSTOMER. PRINT MAILING LABELS AND PRINT CUSTOMERS BILLS.	$ 75.00
MAILING LABLES #100 PRINT MAILING LABELS FROM YOUR COMPLETE FILE, FOR A PARTICULAR CITY OR STATE. USE ONE-PART MAILING LABELS.	$ 50.00
MAILING LABELS #400 SAME AS #100, BUT ALSO PRINTS LABELS BY NAMES. USE MULTIPLE-PART LABELS.	$125.00
BASIC 09 **UPGRADE AT BASIC 4-6809 AND 6809s. RUNS 30% FASTER AND CAN BE USED WITH EXISTING 6800 PROGRAMS TO BE USED WITH 6809 SYSTEMS. NO MANUAL.**	$ 59.95

*** CUSTOMIZED PROGRAMS FOR YOUR BUSINESS REQUIREMENTS ***

CHARGE YOUR ORDER TO YOUR VISA OR MASTER CHARGE

Available from Computer Stores or order direct from:

OMNI TRONICS INC. 1897 RT. 33, CONCORD SQUARE, HAMILTON SQ., NJ 08690

CIRCLE 168 ON READER SERVICE CARD

VIDEOTAPE COMBINED WITH CAI FOR APPLE

Computer Assisted Instruction (CAI), on the Apple II and videotaped teaching can now be combined using the recently announced CAVTRI System. CAI can be inserted into any existing videotape.

A segment of videotape on a topic is presented to a student. The computer is programmed to automatically pause the videotape player after the segment is finished and to switch control of the TV screen to the computer, which generates CAI text on the materials just presented.

The package includes a computer/videotape interface, all necessary wires and connectors, an instructional manual, and a starter cassette containing a group of subroutines that enable the teacher to write CAI programs for integration with videotape. $390 complete.

CAVTRI Systems, 26 Trumbull St., New Haven, CT 06511.

CIRCLE 267 ON READER SERVICE CARD

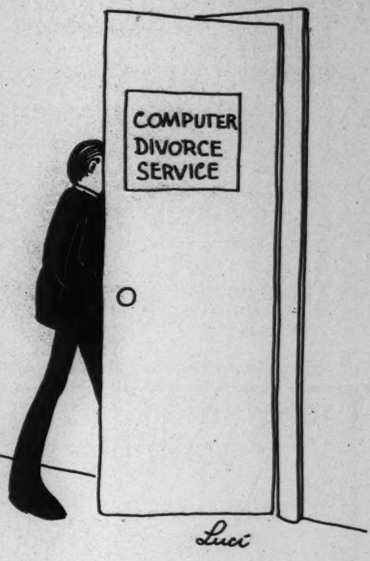
ROBOT VAN FOR TRS-80

An interfaced command unit that plugs into the output port of the TRS-80 operates the 3-G robot van by Radio Transmissions.

The command module operates the van through radio controls. It uses a single port address and does not preclude use of the remaining output ports for other purposes. It is programmed through simple Basic statements to control forward, reverse, right, left, start, and stop. $85.00.

3G Company, Inc., Rt. 3, Box 28a, Gaston, OR 97119. (503) 662-4492.

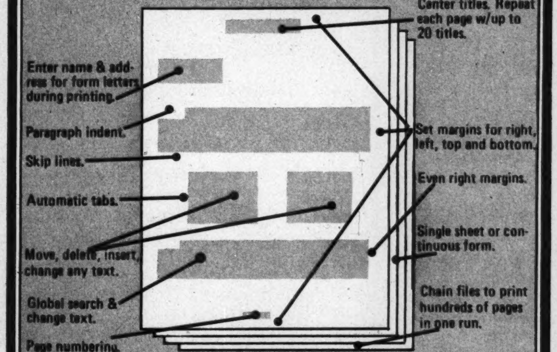
CIRCLE 268 ON READER SERVICE CARD



WRITE-ON!

Low Cost WORD PROCESSING for APPLE

Effortless to use. With simple commands you can format pages, individualize form letters, maintain updated manuals, and quickly prepare long documents. Requires Apple II, Disk, Applesoft and 32K of memory.


Center titles. Repeat each page w/up to 20 titles.
Enter name & address for form letters during printing.
Paragraph indent.
Skip lines.
Automatic tabs.
Move, delete, insert, change any text.
Global search & change text.
Page numbering.
Set margins for right, left, top and bottom.
Even right margins.
Single sheet or continuous form.
Chain files to print hundreds of pages in one run.

Low Price—only $99.50. Dealer discounts available. When ordering, add $2 shipping. Calif. residents add 6% sales Tax. Visa & Mastercharge accepted.

RAINBOW COMPUTING, INC.
9719 Reseda Blvd., Dept. C2, Northridge, Ca. 91324
Telephone (213) 349-5560

SORCERER* SOFTWARE!

All programs on cassette. Only 8k of memory required.

new! **TANK TRAP** by Don Ursem. A rampaging tank tries to run you down. You try to trap it by building concrete walls around it. Four levels of play. **$11.95**

new! Inquire about our **SMART TERMINAL** program.

PLOT by Vic Tolomei. Now Apple owners will be envious of how easy you can get good graphics on your SORCERER. PLOT includes both a super high resolution mode and a quick low resolution mode. Both are accessible from your BASIC programs using simple commands. Hi-res & lo-res examples included on tape. **$14.95**

SHAPE MAKER™ by Don Ursem. Construct special characters and fancy shapes with ease using this on-screen character editor. Detailed 12-page instruction booklet includes example applications. **$14.95**

DEBUG by Bob Pierce. Debug machine language programs by stepping through one instruction at a time. Relocatable. Several display options. Multiple break points. Modify memory and registers. **$14.95**

Z-80 DISASSEMBLER by Vic Tolomei. Decode machine language programs, including SORCERER's monitor and ROM-PAC's, with this Z-80 Disassembler written in BASIC. Prints out machine code, Zilog mnemonics, and ASCII. **$14.95**

FASTGAMMON™ by Bob Christiansen. A fast backgammon opponent. **$19.95**

MAGIC MAZE™ by Vic Tolomei. A challenging maze game. **$11.95**

SOFTWARE INTERNALS MANUAL FOR THE SORCERER by Vic Tolomei. A must for anyone writing software for the SORCERER. Seven chapters. Indexed. Includes diagrams and software routines. 64 pages. **$14.95**

QS QUALITY SOFTWARE
6660 Reseda Blvd., Suite 103, Reseda, CA. 91335
Telephone 24 hours, seven days a week: (213) 344-6599

WHERE TO GET IT: Ask your nearest Sorcerer dealer to see *Quality Software's* Sorcerer programs. Or, if you prefer, you may order directly from us. MasterCharge and Visa cardholders may telephone their orders and we will deduct $1 from orders over $19 to compensate for phone charges. Or mail your order to the address above. California residents add 6% sales tax. Orders outside North America add $5 fot registered airmail, pay in U.S. currency.

*The name "SORCERER" has been trademarked by Exidy, Inc.

CIRCLE 176 ON READER SERVICE CARD

Radio Shack DEALER

COMPUTER SPECIALISTS

15% Discount on TRS-80's - I AND ACCESSORIES

FAST 100 cps Centronics 730 PRINTER. . $800.00
HIGHLY RELIABLE LOBO DRIVES. . .$375.00

MICRO MANAGEMENT SYSTEMS
DOWNTOWN PLAZA SHOPPING CENTER
115 C SECOND AVE. S.W.
CAIRO, GEORGIA 31728
912-377-7120

CIRCLE 159 ON READER SERVICE CARD

for Radio Shack computers

- SUPER DISC — 70 PROGRAMS $13.95
- BUSINESS
- FINANCE
- MATH/STATISTICS
- GAMES

FREE 14 PAGE CATALOG

Write to Elliot Kleiman
National Software Marketing
4701 McKinley Street
Hollywood, Florida 33021

CIRCLE 163 ON READER SERVICE CARD

TRS-80 Model I and II quality software

DATA BASE MANAGER IDM-IV $69
You can use it to maintain a data base & produce reports without any programming. Define file parameters & report formats on-line. Features key random access. fast multi-key sort. field arith., label generator. audit log. MOD-II version with more than 50 enhancements $199.

ACCOUNTS RECEIVABLE ACCT-III $69
One or more drives. Order entry calculates sales tax. shipping. amount for multiple items. Credit checking. aging. sales analysis. invoices. statements and reports. As opposed to most other A/R. ours can be used by doctors. store managers. etc. MOD-II version $149.

WORD PROCESSOR 16K $39. 32K $49. MOD-II $49.
First word processor specifically designed for the TRS-80 that uses disk storage for text. Written in BASIC. No special hardware and text limit. Use for letters. manuals & reports. 32K version features upper/lower case without hardware change and multiple input text files.

MAILING LIST advanced MAIL-V $59.
Fast sort by any field. Multiple labels and reports. 4-digit selection code. new zip code ext.. screen input. live keyboard. powerful report writer. MOD-II $99.

INVENTORY INV-V $99.
9-digit alphanumeric key for fast key random access. Reports include order info. performance summary. etc. Calculate E.O.Q. Powerful report writer. MOD-II $149.

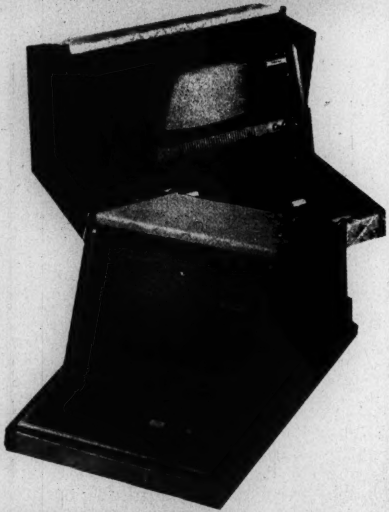
All programs are on-line. interactive. random access. virtually bug free. documented and delivered on disks. MOD-I requires 32K. DOS. We challenge all software vendors to offer low cost manuals so you can compare and avoid those high-priced undocumented. 'on-memory' programs. Send $5 for a MOD-I manual and $10 for MOD-II.

MOD-II programs are extensively modified. guaranteed to run with 1 year newsletter & updates. 10% off for ordering more than 1 MOD-II programs.

MICRO ARCHITECT
96 Dothan St., Arlington, MA 02174

CIRCLE 154 ON READER SERVICE CARD

Miscellaneous



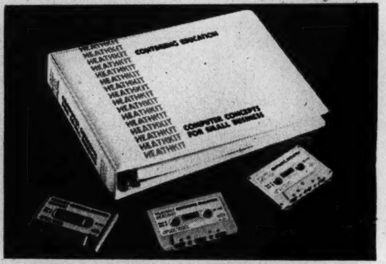
COMPLETE YOUR TRS-80 SYSTEM

Design Co. has put in kit form the C-1 case for the TRS-80 which is made of black ABS thermoformed side panels with the exposed wood sections covered by a silver, leather-like material. $69.50.

The C-2 case is made of black ABS thermoformed side panels with wood sections covered by a silver, quilted. $135.

Designco Consulting Eng., P.O. Box 307, Union, MI 49130.

CIRCLE 269 ON READER SERVICE CARD



COMPUTER BENEFIT

A program, entitled *Computer Concepts for Small Business,* is aimed at the businessperson who knows little or nothing about computers and wants to determine for himself how a computer can reduce costs and increase efficiency.

The program includes three audio cassettes and uses the audio-tutorial teaching technique to guide the reader through the text material, highlighting important points. $49.95

Heath Co., Dept. 350-970, Benton Harbor, MI. 49022.

CIRCLE 270 ON READER SERVICE CARD

FILM ON COMPUTER TECHNOLOGY

A film entitled "Computer Technology: The Endless Revolution" is available from Sperry Univac Worldwide Communications.

The 25 minute color film details state-of-the-art information technology and explores future applications and implications of advanced computer research and development.

Copies of the film are being loaned at no charge, or may be purchased for $80.

John C. Baldwin, Audio/Visual Coordinator, Sperry Univac Worldwide Communications, C2SE10, P.O. Box 500, Blue Bell, PA 19424.

CIRCLE 271 ON READER SERVICE CARD

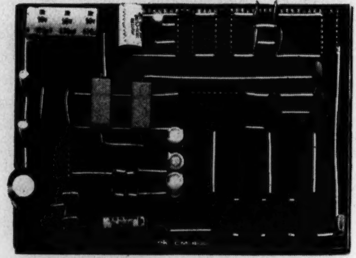
GRAPHICS LAYOUT PAD

The Grapple System for Apple II includes the LO-RES graphics and text layout pad that allows users to produce screen layouts for program development as well as providing tab guides for automatic text centering. The pad contains reminders of the most frequently used graphic commands for easy reference.

The HI-RES graphics screen layout pad eases the task of determining correct coordinates for HI-RES screens, even when copying directly from a drawing or photograph. $3.00 per 50 sheet pad.

Computer Solutions, Personal Information Products, 5135 Fredericksburg Rd., San Antonio, TX 78229, (512) 341-8851.

CIRCLE 272 ON READER SERVICE CARD



SOLDERLESS PROTOTYPE BOARD

CM-600 is a system for solderless construction of circuit prototypes. The CM-600 is a neoprene board 4½"x6" with 2280 holes on .100" centers.

Standard components including DIP's are mounted by inserting leads into the holes in the neoprene material. Interconnections are made using 20 or 22 AWG (0,8 or 0,65mm) wire jumpers. Positive contact is assured by the elasticity of the hole, which compresses the leads together. $6.95.

O.K. Machine and Tool Corp., 3455 Conner St., Bronx, NY 10475.

CIRCLE 273 ON READER SERVICE CARD

CONVERTS MICROPROCESSOR TRAINER TO COMPUTER

Heath Company has announced the introduction of a new Microprocessor Trainer Accessory that converts the Heathkit ET-3400 Microprocessor Trainer into a personal computer.

It provides up to 4K of additional RAM, a new monitor in ROM, a tiny Basic interpreter in ROM, an audio cassette interface and a serial interface for a video terminal.

Heath Company, Dept. 350-910, Benton Harbor, Michigan 49022.

CIRCLE 274 ON READER SERVICE CARD

COMPUTER CLOTHES

Gem Business Systems Ltd. introduces its line of Computer Clothes. These are heavy gauge, Naugahide covers. Each cover is custom tailored to protect the computer or word processing machine from damage. Unlike plastic, Naugahide breathes and will not cause condensation.

Gem Business Systems, Ltd., 60 E. 42nd St., New York, NY 10017. (212) 682-9005.

CIRCLE 275 ON READER SERVICE CARD

DISK INDEX FORMS

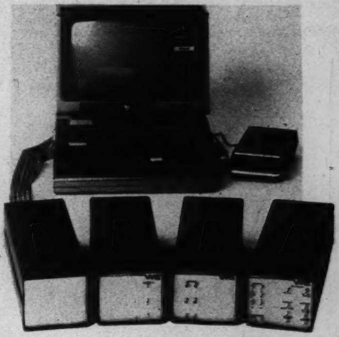
A package of forms is available to help TRS-80 disk users keep track of their programs.

Form 1, the index, allows the user to keep track of free space, available languages and utilities, and log trouble for diagnosing hardware/software problems.

Form 2, the directory, keeps filespecs, passwords, and program size handy. Forms to index 25 diskettes are $3.00 plus 75¢ postage and handling.

Stevens Computer Products, P.O. Box 942, Glendale, CA 91209

CIRCLE 276 ON READER SERVICE CARD

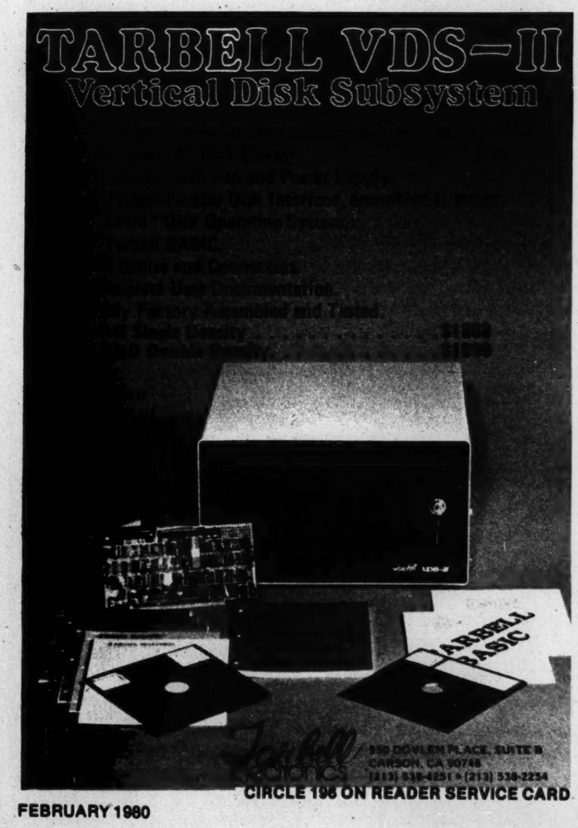


VIDEO MODULAR SYSTEMS

Etra Technology Research Associates, Inc. announces the Video Modular Systems (VMS), a series of inexpensive video processing modules. The configured modules will internally generate a color display which facilitates the education of the user in R.G.B. color mixing by displaying all 16 levels of R.G. and B., as well as their combinations, in four sequential vertical volumns across a standard color monitor. This will produce 4096 colors.

G.E.S.I., 1440 San Pablo Ave., Berkeley, CA 94702. (415) 527-7700.

CIRCLE 277 ON READER SERVICE CARD

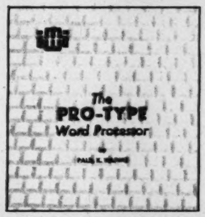


TARBELL VDS-II
Vertical Disk Subsystem

[illegible]
[illegible] Cabinet with Fan and Power Supply.
Tarbell Floppy Disk Interface, [illegible]
CP/M* Disk Operating System.
Tarbell BASIC.
[illegible] Cables and Connectors.
[illegible] User Documentation.
[illegible] Factory Assembled and Tested.
[illegible] Single Density . . . . [illegible]
[illegible] Double Density . . . . [illegible]

Tarbell electronics
950 DOVLEN PLACE, SUITE B
CARSON, CA 90746
(213) 538-4251 • (213) 538-2254

CIRCLE 198 ON READER SERVICE CARD



NOW YOU CAN TYPE LIKE A PRO!

IMI's PRO-TYPE is a powerful word processor that is easy to learn and simple to use. Its comprehensive 72-page manual will guide you from beginner, to intermediate and on to advanced applications.

PRO-TYPE packs all of these convenient features into a single 8K program that supports fully interactive text entry, editing, and print formatting:

- Works with ANY Type of Terminal (Memory Mapped or not).
- Floating Tabs and Underlining.
- Change Left and Right Margin, Line Spacing While Printing.
- Double Text Buffers for Form Letters, etc.
- Multiple Print Modes (Justification, line fill, verify)
- Embedded "STOP" Codes allow Special Text Insertion
- Command Macros for Repeated Command Execution
- Easy-to-use Commands to Save and Load Text Files, List Directory, Print Multiple Files.

TYPE LIKE A PRO . . . CHOOSE YOUR PRO-TYPE

72-page PRO-TYPE Manual Only	$25
NORTH STAR 5" SD & DD DISK (with Manual)	$75
MECA ALPHA TAPE (with Manual)	$75
CPM 8" SD DISK (with Manual)	$75

Add $ .75 Special 4th Class or $1.50 Special Handling or UPS

imi Interactive Microware
P. O. Box 771 • State College, Pa 16801
(814) 238-8294

DEALER INQUIRIES INVITED

CIRCLE 146 ON READER SERVICE CARD

Miscellaneous

SWITCHABLE ISOLATOR

Electronic Specialists announces the Switchable Isolator, featuring input spike/surge suppression together with three individually switched and filtered sockets.

Total Isolator load capability is 1875 watts MAX, with each switched, filtered socket capable of handling a 1 KW Load. Each switch has an associated pilot light. $119.95.

Electronic Specialists, Inc., 171 S. Main St., Natick, MA 01760. (617) 655-1532.

CIRCLE 278 ON READER SERVICE CARD

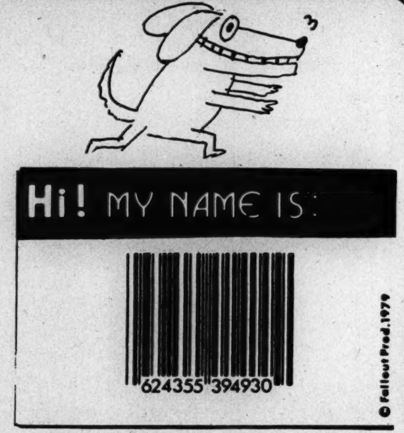
AUTOMATIC LOGGING RECORDER

Omnicron's automatic logging recorder automatically documents 10 hours of telephone conversations, two-way radio messages, computer data, or dictation on a standard cassette tape. Every recording is available for playback at the touch of a single button, either immediately after its receipt, or months later.

Other features of the CTR-8LP recorder include: monitor while recording; end-of-tape alarm which beeps when the tape needs to be turned or replaced; digital tape footage counter; "LED" record indicator; AC/rechargeable battery operation; and adjustable audio threshold with DC sensing to prevent activation between conversations. $257.50.

Omnicron Electronics, 1 Mechanics St., P.O. Box 623, Putnam, CT 06260. (203) 928-0377.

CIRCLE 279 ON READER SERVICE CARD



COMPUTERIZED NAME TAGS

Fallout Productions present Numb Tags, adhesive paper stickers bearing the legend "Hi! My Name Is:" followed by a representation of the Uniform Price Code.

According to the manufacturer, "Numb Tags allow consumers to register their feelings about the increasing computerization of American society."

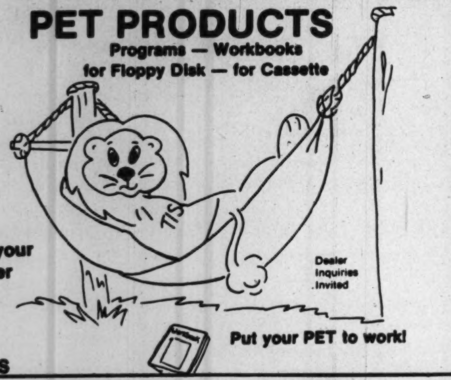
Fallout Productions, P.O. Box 355, Fairfax, CA 94930. (415) 456-6306.

CIRCLE 280 ON READER SERVICE CARD

• PET • PET • PET • PET • PET • PET • PET • PET • PET • PET • PET • PET • PET • PET

PET PRODUCTS

Programs — Workbooks
for Floppy Disk — for Cassette



See your Dealer

Dealer Inquiries Invited

Put your PET to work!

T I S

PROGRAMS

- SW-1* **MAILS** mailing list system
- SW-2* **CHECKBOOK** record
- SW-3* **ACCOUNTS** keep track of who owes you how much
- SW-4 **MEDIT** create and maintain data files
- SW-5* **CALENDAR** appointments, meetings at a glance

WORKBOOKS

WB-1	Getting Started with Your PET	$3.95
WB-2	PET String and Array Handling	$3.95
WB-3	PET Graphics	$4.95
WB-4	PET Cassette I/O	$4.95
WB-5	Miscellaneous PET Features	$3.95
WB-6	PET Control and Logic	$3.95

*These programs are special purpose data base management systems. They all can:

- Sort numeric or string fields
- Select based on numeric or string (=)
- Select based on substring match
- Select based on range of entry number

Prices: $9.90 each for programs using cassette storage for data
$12.95 each using sequential floppy disk storage for data.
Price includes 40 - 60 page instruction manual

Add $2.00 for shipping and handling

Money back guarantee

TIS
P.O. Box 921, Dept. CC
Los Alamos, NM 87544

VISA

On bank card orders, give all numbers

PET is a trademark of Commodore Business Machines

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CIRCLE 203 ON READER SERVICE CARD

TERMINALS

FROM TRANSNET

PURCHASE FULL OWNERSHIP AND LEASE PLANS

DESCRIPTION	PURCHASE PRICE	PER MONTH 12 MOS.	24 MOS.	36 MOS.
LA36 DECwriter II	$1,695	$162	$ 90	$ 61
LA34 DECwriter IV	1,295	124	69	47
LA120 DECwriter III KSR	2,295	220	122	83
VT100 CRT DECscope	1,895	182	101	68
VT132 CRT DECscope	2,295	220	122	83
DT80/1 DATAMEDIA CRT	1,895	182	101	68
TI745 Portable Terminal	1,595	153	85	57
TI765 Bubble Memory Terminal	2,795	268	149	101
TI810 RO Printer	1,895	182	101	68
TI820 KSR Printer	2,195	210	117	79
TI825 KSR Printer	1,695	162	90	61
ADM3A CRT Terminal	875	84	47	32
QUME Letter Quality KSR	3,195	306	170	115
QUME Letter Quality RO	2,795	268	149	101
HAZELTINE 1410 CRT	875	84	47	32
HAZELTINE 1500 CRT	1,195	115	64	43
HAZELTINE 1552 CRT	1,295	124	69	47
DataProducts 2230 Printer	7,900	757	421	284
DATAMATE Mini Floppy	1,750	168	93	63

FULL OWNERSHIP AFTER 12 OR 24 MONTHS
10% PURCHASE OPTION AFTER 36 MONTHS

ACCESSORIES AND PERIPHERAL EQUIPMENT

ACOUSTIC COUPLERS • MODEMS • THERMAL PAPER
RIBBONS • INTERFACE MODULES • FLOPPY DISK UNITS

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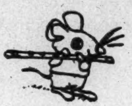
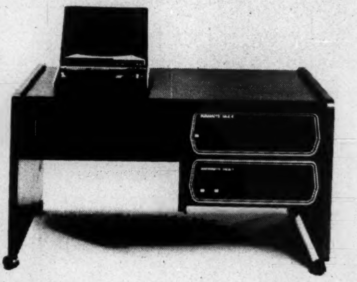
201-688-7800
TWX [illegible]

CIRCLE 200 ON READER SERVICE CARD





"COMMAND CENTER" DESK

Dynabyte announces the availability of a new Command Center desk configuration designed to house the DB8/1 computer and DB8/4 dual 8" floppy disk unit mounted on pull-out rolling rack for easy access.

It also accommodates the DB8/2 computer which is self-contained with dual 5¼" floppies and lower storage drawer. $500.

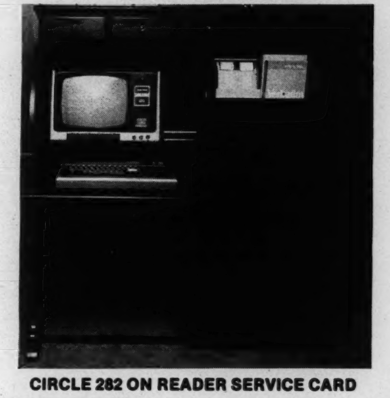
Dynabyte, 115 Independence Dr., Menlo Park, CA 94025. (415) 329-8021.

CIRCLE 281 ON READER SERVICE CARD

ROLL-TOP DESK FOR MICROS

Personal Programming Service announces a teak wood roll-top desk designed specifically for the TRS-80 and its peripherals. The keyboard and expansion interface are hidden beneath a false drawer when not in use, and removable disk cabinet will accommodate up to four drives. Small drawers are for diskettes/cassettes and large drawers are printer paper sized.

Personal Programming Service, Inc., 14600 Goldenwest St., Westminster, CA 92683. (714) 894-3736.



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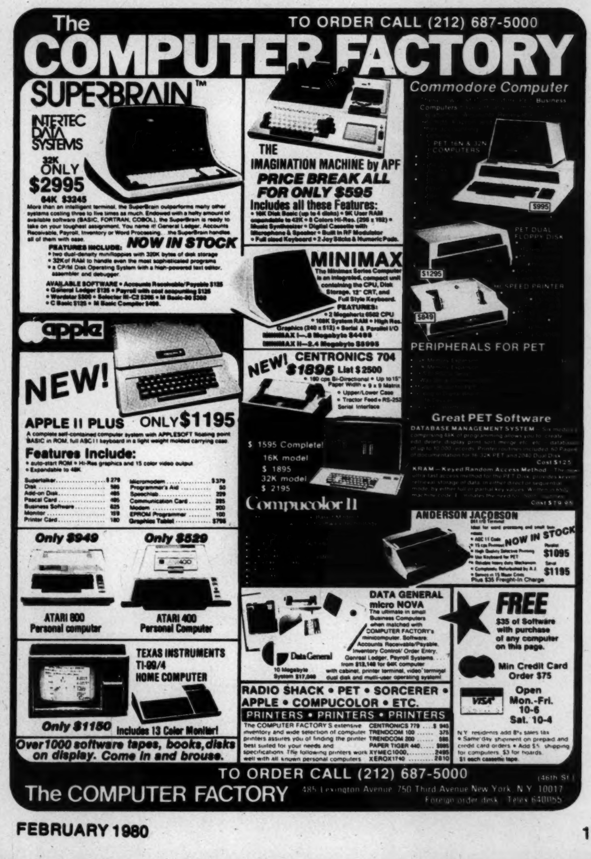

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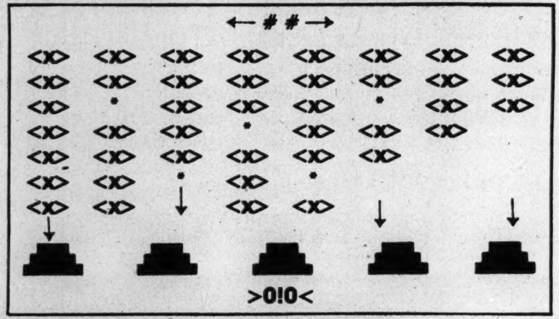

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CIRCLE 155 ON READER SERVICE CARD

Computer Trivia Contest Results and Winners

Before getting into a discussion of the contest, let me note an unfortunate ommission in our original contest description (Sep 1979, page 156). We neglected to mention that the idea for the contest came from Games magazine "Calculatrivia Marathon" in their Nov/Dec 1978 issue. Their contest was so successful that they are running another one in their Nov/Dec 1979 issue. Will we run another one? At this point the several of us who acted as judges are decidedly bleary-eyed and I can't say whether the memory of this one will ever fade enough that we'll ever want to do it again.

Due to two problems: 1) a particularly sticky question which no one got correct, and 2) an error in the statement of the rules, no one got the correct answer.It was, incidentally, supposed to be 9-3/8 or 75/8. Nevertheless, all 179 prizes have been awarded as well as 300 certificates of merit to entrants who got at least 22 variables correct out of the list of 44.

The sticky value was K, the number of cardinal points on a Viking compass. Jon Max found a reference which stated, "In this navigation neither compass nor chart was used. As late as the fifteenth century, it was believed in Southern Europe that these regular tools of Mediterranean seamen were unknown to those of the North." Steve Stearns could only find reference to "a lodestone device used by Scandinavian mariners to indicate north-south (2 points). Also, a wooden device having 32 notches has been found in a Viking settlement ruin. While not a compass, some scholars have suggested that it was used to determine direction." Alan Frisbie also opted for an answer of 32 after two full weekends researching this question at the UCLA Reference Library and the Los Angeles Public Library. He concluded that it was a truly rotten question." Perhaps so, but our reference source indicates 6 cardinal points on a Viking Compass.

Another nasty variable was Q, the number of satellites of Jupiter observed through 1970. Most encyclopedias list twelve although several "lesser" sources mention 13. Why? The extra moon had indeed shown up on photographic plates in 1970 and had been proved to exist by computer orbital studies of the other satellites but the thitreenth was not "officially" acknowledged until September 1974. In the contest, we accepted either twelve or thirteen as correct.

Both T and gamma asked for information about computer games. Of course, many versions of both Mugwump and Wumpus exist. We, quite naturally, were looking for the values in the original versions, both of which appeared in **Creative Computing**, and our books of computer games.

Speaking of **Creative Computing**, we were astonished at the number of people who answered with a year other than 1974 for the first year of **Creative Computing**, (lambda). While 1974 was not a full year of publication, we started recruiting contributing authors in April and our promotional literature was distributed starting in June. The first issue was published in October with a cover date Nov/Dec 1974.

Variable L, "the Digital Equipment Corp. B171 Flip Chip has ——— diode inputs," was 12. No question about that, however, we understand that several DEC offices would like to see me drawn and quartered with the remains thrown out for the buzzards. They got so many phone calls that **Creative** is very unpopular with them. Perhaps our recent purchase of a $76,000 PDP 11/34 for subscription fulfillment will temper this view somewhat.

Pi was frequently missed. It stated,"3 is to 9 and 18 as 2 is to 8 and ——." The answer is $24-3^2=9$ and $9x2=18$. Following that logic, $2^3=8$ and $8x3=24$.

Several "historical questions" dating back as few as three years proved troublesome to many contestants. R, the microprocessor used in the first Altair, was an 8080. We got answers of 8008 and 4004 (not even true microprocessors), 6800, 6502, 8800, and some really strange ones like 80, 16, 12 and 2. In the same vein, contestants reported that a baud rate of the ASR-33 Teletype (X) was 10, 75, 80, 150, 210, 300, 1000 and many other strange values. It is 110.

In some instances, we were not completely clear on the units of measurement in which a value was to be expressed. The correct answers submitted by the majority of entrants indicated that this was not a serious flaw.

The problem in making the formula "work" was in the rules which stated that the values were to be determined to the nearest integer. Value P, "to convert from microvolts to gigavolts, multiply by ———" was $1x10^{-15}$. Many contestants, rightly so, entered this value as 0. Zero has a truly nasty effect on evaluating the formula. It was my mistake and I assume full blame (for what it's worth) for letting this nastiness creep into the contest.

The winner, with 42 of the 44 values correct, was Alan Frisbie of Pasadena, CA. He will recieve the grand prize of a Craig M-100 Foreign Language Translator courtesy of Craig Corporation, 921 West Artesia Blvd., Compton, CA 90220. Second prize goes to P.J. Evans, also of Pasadena, CA. He will recieve Logix Industries' TEAMMATE Computer.

The four people who missed five values will receive various electronic games. They are: Jay Legenhausen of Highland Park, N.J; Amy Kurtzman of Nashua, N.H; Andrew Klossner& Lauri Rathmann of St. Joseph, MI; and Joanne Bioni of Oxon Hill, MD.

The next group of thirteen people missed six values; all will receive an electronic or battery action game. Special mention should go to Hank Gupton of Seattle; WA in this group as the contestant who sent in the most entries (5) although, since they were submitted under the names of various family members, we're not sure who was the actual entrant.

Down in the group of eight to 15 incorrect values we begin to get Very Large clusters of entrants with the peak occuring at 11 incorrect. Booby prize goes to the four contestants with fewer than 15 correct responses. My eight year old son did better than that!

-DHA

ium...compendium...co

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The computer bars are now in 200 locations of major beverage operators. The cost of a pouring station with optional equipment starts at around $14,500.

DON'T YELL, I CAN HEAR YOU!

The first connected speech understanding computer system in which an operator communicates directly with a computer through a microphone, has been developed by Dr. Raj Reddy and Dr. Bruce Lowerre of Carnegie-Mellon University.

The system can recognize a thousand word vocabulary with high accuracy as well as 95% of the sentences spoken to it. Although questions must be within the constraints of specific tasks and phrased fairly precisely, this is still a less rigid format than most other means of addressing the computer. Normally, instructions are issued to the computer through key words and symbols that are typed into a terminal. The smallest deviation, even a comma out of place, results in the machine being unable to process the instruction.

At present, the system can recognize the voice patterns of five operators. The machine requires up to four minutes to understand three seconds of speech, but its developers think that reasonable engineering and research efforts will increase the speed to that used in human conversation.

Dr. Reddy stresses that the system is not capable of engaging in intelligent general conversation. "We don't even know if that is possible," he says, "although some of the components needed for that kind of system are functional, and others appear to be feasible."

Dr. Reddy and other researchers in the computer science department are also working on an Image Understanding Project. Perfecting a machine that can analyze and recognize pictures is a very complex problem. Possible uses of such a satellite photographs, which now can be studied only by humans.

Edmund Delaney

* * *

A woman who lived by the Book
and no indiscretion would brook,
slapped with a smack
an immense univac,
so calculating was its look.

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CIRCLE 143 ON READER SERVICE CARD

THE MAN WITHOUT A DESK

WASHINGTON — Edward W. Scott, an assistant secretary of transportation, isn't your typical bureaucratic paper pusher. In fact, he is pushing less and less paper all the time.

Mr. Scott is pushing buttons instead. He can push a button on the computer keyboard at his desk and his daily calendar will pop up on a television-type screen. He can look at the calendars of key subordinates, too, find out when everybody is free, and set up a meeting.

When Mr. Scott's computer is completely set up, sometime in 1980, it also will serve as a powerful electronic mailbox. He will be able to peruse timely staff memos on his desktop screen and fire off messages of his own from the attached computer keyboard. Driving the system is a minicomputer that will provide a combination card file, telephone log, doodle pad and filing cabinet, permitting Mr. Scott and most of his 900 subordinates to retrieve everything from an old business letter to a blank expense-account voucher—and have it printed on paper, if absolutely necessary.

What's more, the system will be portable. By toting a lightweight computer terminal around on trips, Mr. Scott can simply plug into an ordinary telephone and dial the minicomputer back in Washington. "People can work at home, in a hotel room or wherever," he says.

Mr. Scott's "automated office" is an experiment but many experts in the communications field say it is the wave of the future. The past 15 years have seen the digital computer reshape the jobs of stock-market traders, typists, insurance-company clerks and newspaper reporters, among others. Now the computer is beginning to make its mark in the offices of professionals and general managers who have never typed and never dreamed of doing hand-to-hand combat with such a machine.

"We had an experiment at AT&T in Morristown (N.J.) involving one executive vice president and four or five vice presidents," recalls James Burke, a marketing manager at the Illinois Bell Telephone Co. unit. The boss had a device nicknamed a "tickler" file built into his electronic calendar. It reminded him when underlings' reports were overdue, and it gave him a perfect memory.

"The pressure was unbelievable," Mr. Burke says. "No follow-up was ever missed. Finally his people said, 'This is driving us nuts.' " And the calendars were removed.

Computers also create problems of a simpler sort. Many executives and professionals can't operate computers because they can't type. And often, they don't want to learn to type, because typing smacks of lower-status clerical work. Still others are scared of the inhuman, incomprehensible machine.

"I was terrified of that thing when I started," says Roberta Skelton, a vice president at Continental Illinois National Bank & Trust Co., Chicago. That was five months ago, when Miss Skelton volunteered to work with an IBM computer terminal a few feet from her desk. She since has made peace with the machine and calls it "an enormous troubleshooting system."

Recently, Miss Skelton needed to know if a corporate customer's $5 million check had been cashed and cleared the bank. Back in the old days, she would have called the bookkeeping department and ordered a page-by-page search of daily ledgers. Under the new system, the bank's IBM computer stores 22 million recently cashed checks, and by pressing a few buttons Miss Skelton instantly learned that the $5 million check had been cashed the day before.

Besides storing millions of checks, Continental Bank's central computer stores some 20 billion bits of electronic information about loans, certificates of deposit, checking and savings deposits, trusts, credit histories, current money-market rates and the racquetball appointments of Louis Mertes.

Mr. Mertes is vice president in charge of Continental's computer systems, and he may be the only vice president in American banking who doesn't have a desk. He usually sits on a couch with a computer keyboard in his lap, punching keys that flash an endless series of reports and memos on a giant screen that occupies a corner of his wood-paneled office. A single drawer in a lamp table is his single concession to the paperbound world that flourishes around him.

"I'm trying to be absolutely paperless," Mr. Mertes says, noting that Continental Bank personnel turn out 500,000 pieces of paper a day. "I'm trying to push myself to the limit." In so doing, he hopes to discover where paper belongs and where it can be replaced by electronics.

All these computers contain sensitive information, of course, and businesses are finding new ways to safeguard what is inside them. First National Bank of Chicago is installing an experimental system, costing more than $100,000, that bars a person from the bank's computer room unless he has the right voice. The computer compares the voice characteristics of the admissible employee with those of the person at the door. If they match, he's in. "It verifies that you are who you say you are," Mr. Sullivan says.

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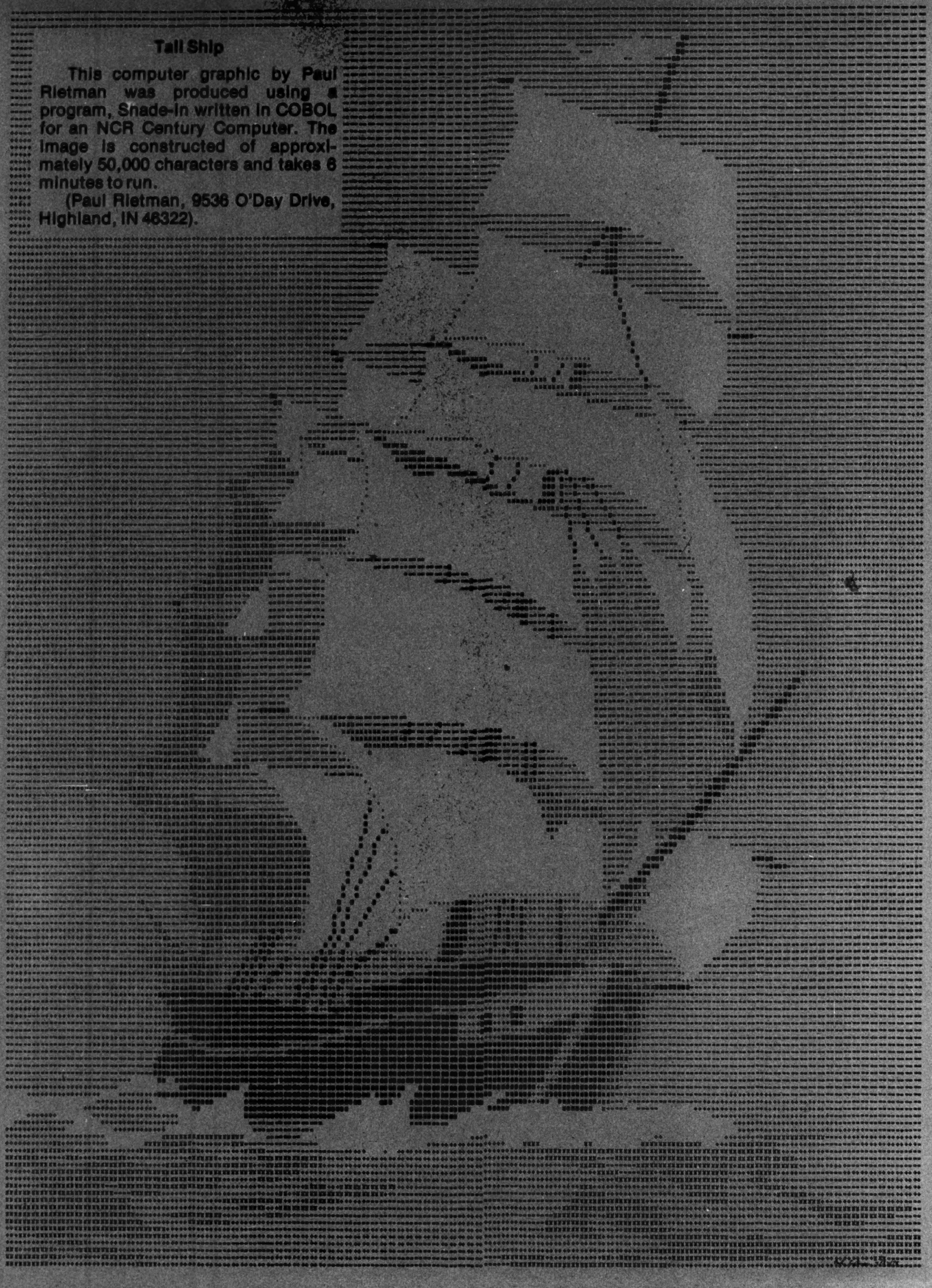
Tall Ship

This computer graphic by Paul Rietman was produced using a program, Shade-In written in COBOL for an NCR Century Computer. The image is constructed of approximately 50,000 characters and takes 6 minutes to run.

(Paul Rietman, 9536 O'Day Drive, Highland, IN 46322).



PERFORMANCE RATING CHART

Compiled by Lawrence and Gail Bloom, Edited by David Ahl

	CHAIRMAN OF DEPARTMENT	PROFESSOR	ASSOCIATE PROFESSOR	ASSISTANT PROFESSOR
Quality of Work	Leaps tall buildings in a single bound	Leaps short buildings at a single bound	Leaps short buildings with prodding	Barely clears a quonset hut
Initiative	Is more powerful than a locomotive	Is more powerful than a switch engine	Is almost as powerful as a switch engine	Loses tug of war with locomotive
Timeliness	Is faster than a speeding bullet	Is just as fast as a speeding bullet	Is faster than a speeding BB	Can fire a speeding bullet
Adaptability	Walks on water	Walks on water if the sea is calm	Swims in water	Keeps head above water under stress
Communication	Gives policy to God	Talks with God	Talks with God if a special request is approved	Is occasionally addressed by God

	INSTRUCTOR	RESEARCH ASSOCIATE	GRADUATE STUDENT	TECHNICIAN
Quality of Work	Makes high marks on wall when trying to leap buildings	Bumps into buildings	Cannot recognize buildings	Lifts buildings and walks under them
Initiative	Is run over by locomotive	Recognizes locomotive 2 out of 3 times	Says, "Look at the Choo-Choo."	Kicks locomotives off the track
Timeliness	Misfires frequently	Is not issued ammunition	Wets himself with water pistol	Catches bullets in his teeth and eats them
Adaptability	Washes with water	Plays in mud puddles	Passes water in emergencies	Freezes water with a single glance
Communication	Talks to animals	Talks to walls	Mumbles to himself	Is God . . .

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Computer zeroes in— on nothing

BY DAVID FLICK

Mrs. Deborah Miller, 5255 Southgate Boulevard, Fairfield, went to Bethesda North Hospital a few months ago for an X-ray and ended up with a lingering pain in the neck.

Shortly afterward, she received a bill for $109.50, with the notation that her insurance company had paid that much and that the amount due was $0.00.

A month ago she received a second letter notifying her that she still owed $0.00 and asking for payment.

So Mrs. Miller obliged. She wrote out a check for $0.00 and sent it out with a cover letter explaining that she had not been aware she still owed that amount.

"May I compliment you on the efficiency of your accounting department," she added.

Accounting departments are not known for their sense of humor. Last week she received a third bill for $0.00, bearing the no-nonsense label, "Final Statement."

"We have not received full payment from you," the letter warned. "Please pay within 10 days or your account will be referred for collection."

Mrs. Miller said she is going to hold out.

Margaret Gromlich, a spokeswoman for Bethesda North Hospital, said the computerized billing services should stop sending the $0.00 statements when the insurance company pays the bills.

She said that can take several months.

Reviews

Stephen B. Gray

Computers In Business: An Introduction, by Donald H. Sanders. McGraw-Hill Book Co., New York. 469 pages, hardcover $15.95. 1979.

This textbook contains 17 chapters, grouped into five parts, on concepts and history, the information revolution, introduction to computers, input/output, the CPU, information systems, programming, languages, impact on planning and organization, impact on staffing and management control, social implications of business use, management of computing resources and computers and the future.

Two short appendices show how an IBM 29 keypunch works, and provide an EDP glossary.

The text, by a TCU professor, is designed for use in an introductory one-semester course in computer data processing offered at an early stage in a college program, according to the preface. Access to a computer is not required.

The coverage is broad, the writing usually straightforward (although containing some very long and meandering sentences), and relieved occasionally with humorous quotes and some of the better cartoons from Datamation and other magazines, including Creative Computing, "inserted to help maintain student interest and to reinforce important points that are presented."

BASIC is described as "by far the most popular high-level language used in microcomputer systems. (A number of recreational and educational programs are published in each issue of such magazines as Creative Computing and Byte that cater to individual users of microcomputers, and these programs are usually documented in BASIC.)"

The text could perhaps have been made a little less formidable-looking by breaking up the many large chunks of solid sans-serif type that make many of the pages without artwork look rather bleak.

* * *

Electronic Games: Design, Programming, and Troubleshooting, by Walter H. Buchsbaum and Robert Mauro. McGraw-Hill Book Co., New York. 335 pages, hardcover $17.50. 1979.

"A comprehensive look at all aspects of electronic games from the point of view of the electronics professional," is how the press release describes this rather expensive book, and the description is most apt.

The dozen chapters are on Electronic Game Fundamentals, TV Picture Parameters, Video Effects, Sound Effects For Electronic Games, Microprocessor Fundamentals, Programming, Programming Storage Techniques, Microprocessor Applications To Games, Electronic Game Parameters, Design Examples, Typical Electronic Games and Troubleshooting Techniques.

From the chapter titles alone it's obvious that the authors have taken a very broad look at the subject. The 338 well-chosen illustrations are a great help.

Even if you're not about to design an electronic game, you can learn a great deal about what makes them tick, including much more than just the basics of video and sound, 8080 assembly-language programming, memory and video graphics. Two games are examined in detail: Pit and the Pendulum, and Blackjack, with flowcharts, schematics and programs. The chapter on typical games briefly examines a dozen, including Code Name: Sector, Chess Challenger, Missile Attack, Indy 500 and Fonz.

Only the chapter on sound effects might be rather tough for the non-EE computernik, who's sure to find most of this book fascinating.

Systems Extensions (For TRS-80 and Other Microcomputer Systems). The Bottom Shelf, Inc., Box 49104, Atlanta, GA 30359. 129 pages, paperback $3.00. 1979.

This is one of the more peculiar "books" in an industry that has seen a variety of peculiar books. It's an oddball because it's actually a catalog of TBS software and hardware filled out with a dozen of the most uninteresting articles you're liable to find outside one of those little mass-circulation paperbacks that are supposed to tell you all about personal computers.

The three pages on 'Computers of the Past' are mostly nonsense, mentioning only LSI chips and MIS, and absolutely nothing about computers of the past. The next article, on 'Computers of the Present,' is almost entirely about the TRS-80. The Apple is mentioned briefly twice, and is said to be made by Commodor.

And so on, words put on paper to fill space. Reading the text is a strain on the eyes, because of the great many spaces between words, due to the total lack of hyphenation.

A couple of the pages are useful, such as part of 'Care of Your Computer,' a pro-and-con review of Electric Pencil (oddly, the only review in the book), an index to Radio Shack's Level-II manual (hard to read: too much space between items and page numbers), and several software routines.

More than half the book, 66 pages out of 129, comprise the "TBS New Products Section," with full details on, and many large photos of, products such as Library 100, Checkbook II, Electric Pencil, NEWDOS+, cassettes, disks, printer paper, forms, binders, file cabinets, desks, chairs (16 of them), magazines, and "the total TRS-80 line of products," which TBS also sells, from the 4K Level-I machine to carrying cases.

Most (all?) personal-computer companies give away their catalogs. TBS sells you their catalog in the form of a book, containing 59 pages of next-to-worthless filler material, despite the TBS ad that claims it "provides a theoretical computer background for the novice computer user." Not by a long shot.

By the way, the accent is almost entirely on the TRS-80, despite the "other microcomputer systems" in the subtitle. No other micros are mentioned (other than the Apple and "Commodor" PET, very briefly), the software routines are all for the TRS-80, and so is every single one of the software and hardware products in the catalog.

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Computer Programming Handbook

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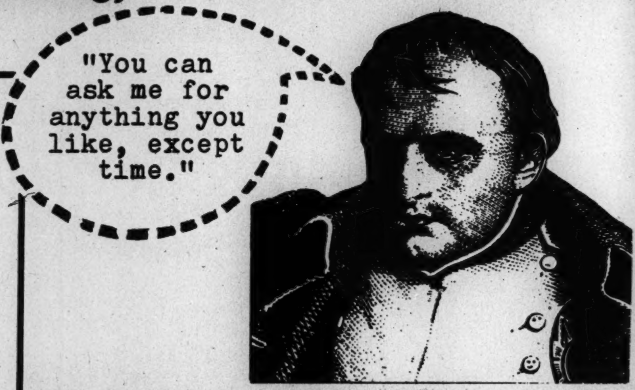
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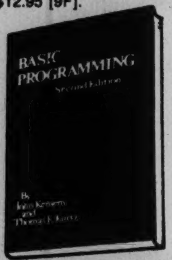

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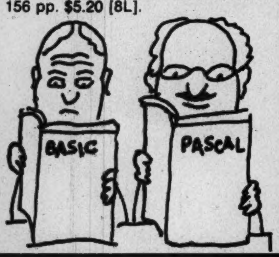

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Albrecht, Finkel, & Brown. This book shows you how to read, write, and understand the BASIC programming language used in the new personal-size microcomputers. Includes detailed descriptions of everything you need to know to make your computer work for you—includes how to get started, numerous applications and games, lists of resources, much more. 332 pp. $6.95 [7G]

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The Computer Book, by **Fred Lee**. Artech House, 610 Washington St., Dedham, MA 02026. 380 pages, paperback $28. 1979.

Here is one of those books that will leave few readers feeling neutral about it; they will hate it or like it very much. The $28 price alone will cause some to dislike it instantly, because most paperback books of this size and complexity sell for half that.

What makes this book controversial, I think, is that it starts right off as a workbook and gets complicated very fast. For openers, "the top third of each page graphically represents memory and address registers to be filled in by you, the reader-as-programmer," according to the Artech news release. "At each location, the reader is instructed in what to do and where to go next. As a result, the reader actually goes through the same logical steps that a computer would follow while running a program."

Yep, right in the foreword, even before you get to page 1, the top of the page shows you a rectangle containing three lines of circles representing a computer's front panel, with 12 circles for memory, 12 for address and three labelled F, I and E. Although you work with these from the very beginning, not until page 147 do you find out exactly what they all mean. Meanwhile, you've been snowed with a lot of mnemonics. The top of page one is full of them, without any explanation whatever.

After discussing number systems, and binary adding and subtracting in conventional fashion, the text gets rather weird for a spell. Chapter 4, on Vacuum Cleaners (yes, vacuum cleaners) and Circuits, gets into logic circuits by first discussing them as pneumatic circuits, showing exactly how you might use a vacuum cleaner, rubber hose and rubber balls to construct a NAND, NOR and flip-flop. These are then translated into equivalent transistor circuits.

The next chapter, on Big Building Blocks, gets into transfer gates, buses, counters, decoders and accumulator arithmetic. Subsequent chapters are on Memories, Peripherals, Planning the Computer, Organization of the Computer, Programming, Thumbs-On Experience, Our First Program Steps, Assembly Language, High Level Languages, FORTRAN, COBOL, Microprogrammed Computers and Microprocessors.

Until the chapter on FORTRAN, which begins on page 239, the only language used is assembly language. The four programs in the chapters on programming are all in assembler. The chapter on high-level languages is five pages long.

The text on each page is equal to about two-thirds as much as a standard text on computing; the left margins are 2½ to 3 inches wide, and are seldom used, except for a few diarams and an occasional buzzword or two. Without the wide margins, and without the top four inches, which most readers may well ignore anyway, the book would be half as big as this 8½-by-11-inch book, which weighs 2¼ pounds as is.

This book is perhaps best used in a classroom with an instructor at hand to explain such mysteries as the mnemonics at the top of page 1, the pneumatic logic and the intricacies of assembly language. The solitary reader may find it all too difficult to follow, unless he is very bright and very persistent.

* * *

BASIC Guide, by Janet Frederick (editor), Heil Ferguson, Steve Hirst and Pete Trotter. CONDUIT, Box 388, Iowa City, IA 52244. 240 pages, paperback $10.00. 1979.

This guide, according to the introduction, "does not define a standard BASIC dialect; rather, it tells how to use any existing dialect effectively, especially if you want to transfer programs between dialects."

Which means it is similar to David A. Lien's "The BASIC Handbook," reviewed here in April 1979 (p 143). The Lien handbook examines over 250 BASIC statements, functions, operators and commands from over 50 of the most used dialects, and gives a test program you can run to see if your computer recognizes the word, a sample run that might be expected if your computer does respond, hints on programming techniques, variations in usage of the word and, when possible, alternate ways to do the same thing using other BASIC words. A very useful book to have when translating programs.

The CONDUIT guide is similar. It first identifies a word as being either "part of almost every BASIC dialect," or in "some extensions not found in all dialects," or in "certain extensions that are both powerful and available in more than one dialect," and calls these three hierarchies Level 0, Level 1 and Level 2.

"Next, examples are given in a box at the top of the page, followed by a list of general forms. The examples are illustrations of the general forms. Finally, there are comments which may include notes on transferrability, alternate syntax, programming style and references."

The words are grouped in chapters: Writing a BASIC Program (character set, statement line, program structure), Arithmetic Expressions, String Expressions, Assigning Values, Printing Output, Documentation (REM), Contro Statements, Loops, Program Segmentation, Files, Matrices and Graphics (RMOVE, RDRAW, etc.).

Two short chapters on System Dependent Features and on Programming Style are followed by three useful appendices. The first includes 23 pages of Summary Charts of BASIC Dialects Studied, 21 dialects altogether, including Level-II TRS-80, IBM 5100, DEC 10, Applesoft, PET, Tektronix 4051, Polymorphic, Dartmouth, Xerox Sigma, HP3000 and Univac.

The second appendix is a mixture of items about Tolerance Testing of Numeric Expressions (with programs to ascertain machine precision), Character Graphics Examples, Alternate Code for Nontransferrable Intrinsic Functions, Alternate Code for Matrix Functions and several other areas of use to dialect translators.

The third appendix provides: Common BASIC Features Not Allowed at Level 0, Common BASIC Features or Practices Not Recommended at Any Level (programs over 800 lines long, TABbing backwards, etc.) and Level 0 BASIC at a Glance.

For people who prefer the academic approach, especially those who find some need for the dialect charts, this book may be useful. The computer hobbyist will prefer Dr. Lien's book, which is much easier to use.

* * *

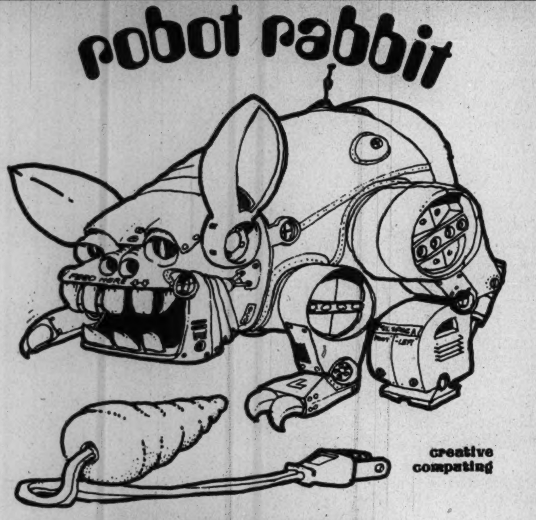
Compilation of State and Federal Privacy Laws: 1978-79, by Robert Ellis Smith. Privacy Journal, Box 8844, Washington, DC 20003. 170 pages, paperback $14.50. 1978.

Published by "an independent monthly on privacy in a computer age," this is claimed to be "the nation's only single source of information about confidentiality statutes... Our hope is to provide a readable book that will give lobbyists, public interest groups, business persons, attorneys, citizens interested in privacy, protections that exist in the 50 states."

The first 19 pages briefly describe federal law and the law in certain states regarding 15 areas such as arrest records, data banks in government, medical records, school records, Social Security numbers, tax records and wiretaps. For example, Connecticut limits wiretap orders to 34 in a 12-month period, and in Minnesota it's illegal to tell someone that a person took a polygraph test.

The remainder of the book reprints representative statutes such as the Arkansas Information Practices Act, the Ohio Personal Information Control Act, the California School Records Law and the Federal Internal Revenue Code on Confidentiality.

Although some of this is not easy reading, and will obviously not have a wide audience, the audience this book does have is undoubtedly increasing as 1984 approaches, and as a larger and larger group of Big Brothers have all too easy access to all but our private thoughts.



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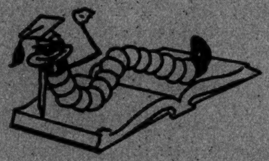
The 6800 Microprocessor: A Self-Study Course with Applications, by Lance A. Leventhal. Hayden Book Co., Inc., 50 Essex St., Rochelle Park, NJ 07662. 108 pages, paperback $5.95. 1978.

Designed as "the basis of a self-study course in microprocessor applications for use with a minimal Motorola 6800 computer," this laboratory manual was written by one of the top authorities in microprocessors, whose informative articles are always a pleasure to read.

The exercises are aimed at electrical engineering and technology students. Although the preface says the author "assumed no particular knowledge of either programming or digital logic," page 3 starts right off with a ones-complement program consisting of LDAA $40, COMA, STAA $41, and SWI. The four instructions are explained, rather briefly, such as "LDAA $40 loads accumulator A with the contents of memory location 0040 (hexadecimal)." So the reader should have some knowledge of just what an accumulator is, and what "memory location" means.

This is all lean meat, fine for those who understand computer jargon, but a few more paragraphs could have been added to help those who don't. Other laboratory exercises cover LED displays, using the keyboard for data entry, blowcharting, common errors, data arrays, debugging programs, subroutines, interrupts, etc.



Personal Computing: Hardware and Software Basics, edited by Raymond P. Capece. McGraw-Hill Publications Co., New York. 265 pages, hardcover $14.95. 1979.

Part of the Electronics Book Series, this guide consists of articles selected from publications such as Electronics, Datamation, IEEE Spectrum, Byte, Mini/Micro Systems and Interface Age.

This is a much better and thorough introduction to personal computers than nearly all the little mass-market paperbacks that have been cobbled together in a hurry by people with little or no knowledge of computers. The advantage of this book is that the articles are written by some of the top authors in computing, such as Portia Isaacson, Carol Ogdin and Sol Libes.

The six introductory articles are fine. The nine in the section on basic computer theory are broad enough to be quite useful to beginners. However, some of the eight articles on advanced microcomputer theory require some engineering knowledge to fully apprreciate. The book's jacket does say, though, "If you're an engineer or a designer, this volume shows you what's happening right now in the microcomputer field." The eight reviews of personal computers, including the TRS-80, PET and Apple II, are, once more, easily understood by the tyro.

The 13 software articles include six written for engineers, and the eight in the last part, on "specifications and other useful information," are easily understood, and include a comparison of microprocessor specs, guide to abbreviations, glossaries for microprocessors and for digital-computer terms and graphic symbols (a filler, since most of them are for components you'll never see on a computer schematic).

All in all, a very good selection of articles for the engineer or the technically-oriented beginner. Even if you're neither, there's still enough information here to make this book worth buying.

Bugbook VIII: 8080/8085 Software Design With 190 Software Solutions, by Christopher A. Titus. E&L Instruments, Inc., 61 First St., Derby, CT 06418. 320 pages, paperback $9. 1978.

The seven chapters of this book show you how to write a variety of assembly-language programs. The chapters are: introduction, basic instructions, subroutines and the use of the basic instructions, advanced instructions, mathematical routines, number-base conversion and microcomputer input/output.

The 190 programs are in such areas as subtracting two 16-bit numbers, creating a 30-second time delay, saving register pair B in memory, adding two packed BCD numbers and suppressing the printing of leading zeroes.

According to the preface, "the programs in this book will run on just about any 8080-based computer."

One of the best features of this book is that the programs aren't presented "cold," but are developed, starting out with the application, discussing it and showing, often in great detail, how an assembly-language program is written to carry out the desired function.

The assembly-language bit-hackers will find this book interesting and valuable.

* * *

How to Make Money with your Microcomputer, by Carl Townsend and Merl Miller. Robotics Press, Box 92, Forest Grove, OR 97116. 164 pages, paperback $6.95. 1979.

The authors don't make any wild promises that you can make big bucks with your micro, but their book does show you how to get a start, in a great many ways.

The first chapter, on How To Write Articles, describes the variety of publications in the microcomputer field, lists each type of reader, describes the types of articles published, gives a 12-step process on how to write your article, tells how to submit your article and ends with advice on how to make money on book reviews.

Subsequent chapters tell how to get your microcomputer book published, operate a service bureau, operate a computer-repair business, develop and sell your software, develop and sell your hardware, sell systems as a consultant, open your own computer store, hold a local or regional computer show, market your product or service, make money teaching others about computers, establish a business and manage your business.

Several helpful appendices tell you about grants and proposals, provide samples of a software license agreement and a service agreement, and give lists of computer magazines, books about how to write, book publishers, and books and articles about starting your own business.

This is not one of those mass-market paperback quickes written for the gullible by itinerant cobblers, but is instead a very helpful, carefully written book, full of excellent ideas.

* * *

How to Make Electronic Music, by Russell Drake, Ronald Herder and Anne Modugno. Crown Publishers, Inc., One Park Avenue, New York, NY. 108 pages, paperback. 1977.

This book covers a series of ideas for creating electronic music, in tutorial style. The authors begin with simple experiments using an ordinary reel-to-reel tape deck, and build up to sophisticated techniques such as use of a synthesizer and mixed media. The emphasis is heavily on electronically modified sounds and music, by changing speed, playing sound backwards, sound-on-sound, and echo. Computer music is not mentioned, but some of the ideas described here might be useful for creating or modifying your own computer music. **Electronic Music** includes an abundance of photographs, activities, examples, and experiments to try. We recommend it to those interested in experimenting with electronic music at a beginning level.

-SN ☐

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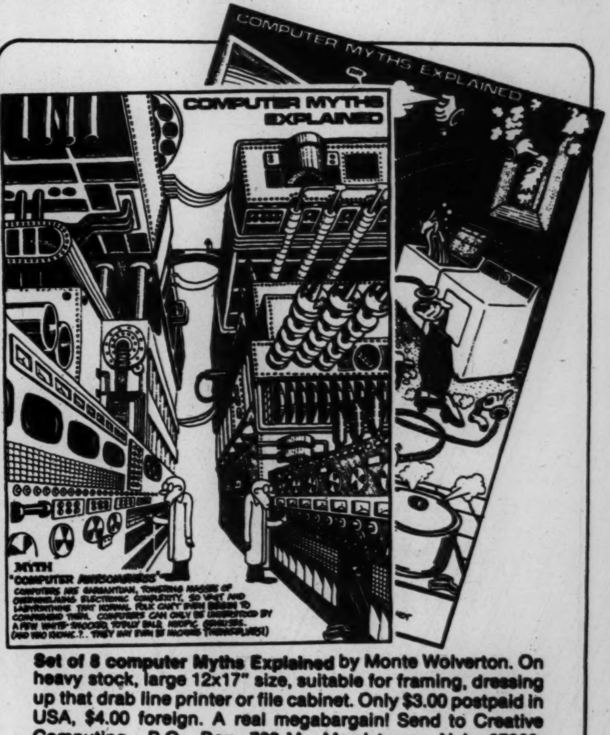
First Philadelphia Computer Music Festival
8 Music Synthesizers
play music by
J.S. Bach
J. Pachelbel
Rimsky-korsakov
Scott Joplin
Neil Diamond
Lennon & McCartney
and 7 more.
Recorded Live

A recording was made of the festival and is now available on a 12" LP record. It features eight different computer music synthesizers programmed to play the music of J.S. Bach, J. Pachelbel, Rimsky-korsakov, Scott Joplin, Neil Diamond, Lennon & McCartney and seven others. The music ranges from baroque to rock, traditional to rag and even includes an historic 1963 computerized singing demonstration by Bell Labs.

The record is available for $6.00 postpaid ($7.00 foreign) from Creative Computing, P.O. Box 789-M, Morristown, NJ 07960.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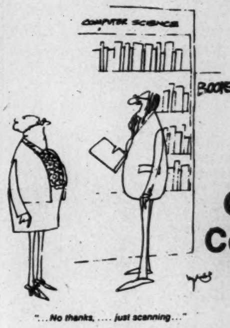
The Best of Creative Computing

The first two years of **Creative Computing** magazine have been edited into two big blockbuster books. **American Vocational Journal** said of Volume 1, "This book is the 'Whole Earth Catalog' of computers." [6A] Volume 2 continues in the same tradition. "Non-technical in approach, its pages are filled with information, articles, games and activities. Fun layout." **—American Libraries.** [6B] Each volume $8.95.



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The Colossal Computer Cartoon Book

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Artist and Computer

This unique book by Ruth Leavitt covers the latest techniques in computer art, animation and sculpture. In its pages 35 artists explain how they use computers as a new means of self-expression. **The San Francisco Review of Books** said "Get yourself a copy of this book if you enjoy feeding your mind a diet of tantalizing high-impact information." Over 160 illustrations, some in full color. 121 pages hardbound [6E] $10.00. Softbound [6D] $4.95.

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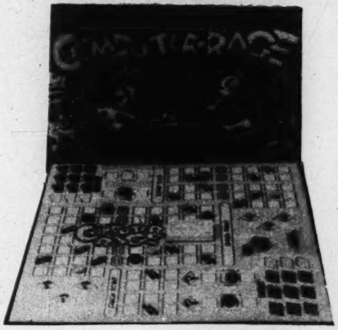

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Now, the same dice used in Computer Rage can be purchased separately. Three binary dice (red, green and blue) in a ziplock bag. $1.25 postpaid [3G].

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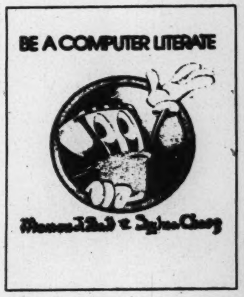
A first introduction to the computer world for children age 10 to 14. Full color diagrams, drawings, photos and large type make this book easy to read and understand. Written by Marion J. Ball and Sylvia Charp. This informative 62-page book is used in many school systems. Softbound [6H] $3.95.



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Puzzle Answers.

Somber Choice: He should light the match first.

Sweet Problem: First, make two vertical cuts, at right angles to one another, across the center of the cake. Then, make one horizontal cut across the middle of the cake.

The Sphinx:
A) 6¼.
B) Neither. They both burn shorter.
C) A stopped clock. The stopped hands will show the correct time twice a day.
D) A carpet.
E) As far as the center, from that point on you will be going out.
F) Because its capital is always Dublin.

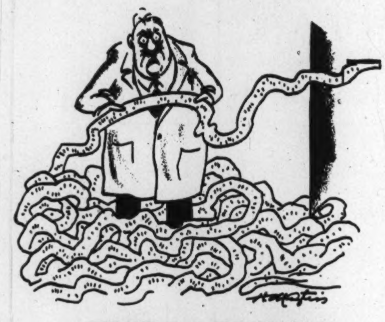
The Five Pairs Puzzle: Consider the cards as being numbered from left to right, 1 through 10. The moves would then be: Card 4 on card 1; card 6 on 9; card 8 on 3; card 2 on 7; and card 5 on 10.

A Tricky Test: 15 and 16 go into box 3, and 17 goes into box 2. The numbers in box 1 are all made using curved lines. The numbers in box 2 are made using only straight lines. The numbers in box 3 are made using both straight and curved lines.

English Anagrams:
(a) William Shakespeare.
(b) Oliver Goldsmith.
(c) William Hogarth.
(d) Joshua Reynolds.
(e) Wordsworth.

The Rhino's Riddle:

$\frac{8888}{8.888}$ and $\frac{8888-888}{8}$



THE LAST BUG

'But you're out of your mind,'
They said with a shrug.
'The customer's happy—
What's one little bug'

But he was determined.
The others went home.
He spread out the program,
Deserted, alone.

The cleaning men came. The
Whole room was cluttered
With memory dumps, punch cards,
'I'm close,' he muttered.

The mumbling got louder,
'Simple deductions,
I've got it, it's right, just
Change one instruction'

It still wasn't perfect
As year followed year
And strangers would comment,
'Is that guy still here'

He died at the console
Of hunger and thirst,
Next day he was buried
Face down, nine edge first.

And the last bug in sight,
An ant passing by,
Saluted his tombstone
And whispered, 'Nice try!'

Author Unknown

(Submitted by J. Prusis,
Dearborn, Michigan)

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   - ☐ E. Scientific American
   - ☐ F. Popular Electronics
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   - ☐ B. Trs-80
   - ☐ C. Apple
   - ☐ D. Sorcerer
   - ☐ E. Challenger
   - ☐ F. PET
   - ☐ G. S-100
   - ☐ H. Other
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   - ☐ C. $30-40K
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   - ☐ E. $50K +
   - ☐ F. none of your business

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   - ☐ C. Apple
   - ☐ D. Sorcerer
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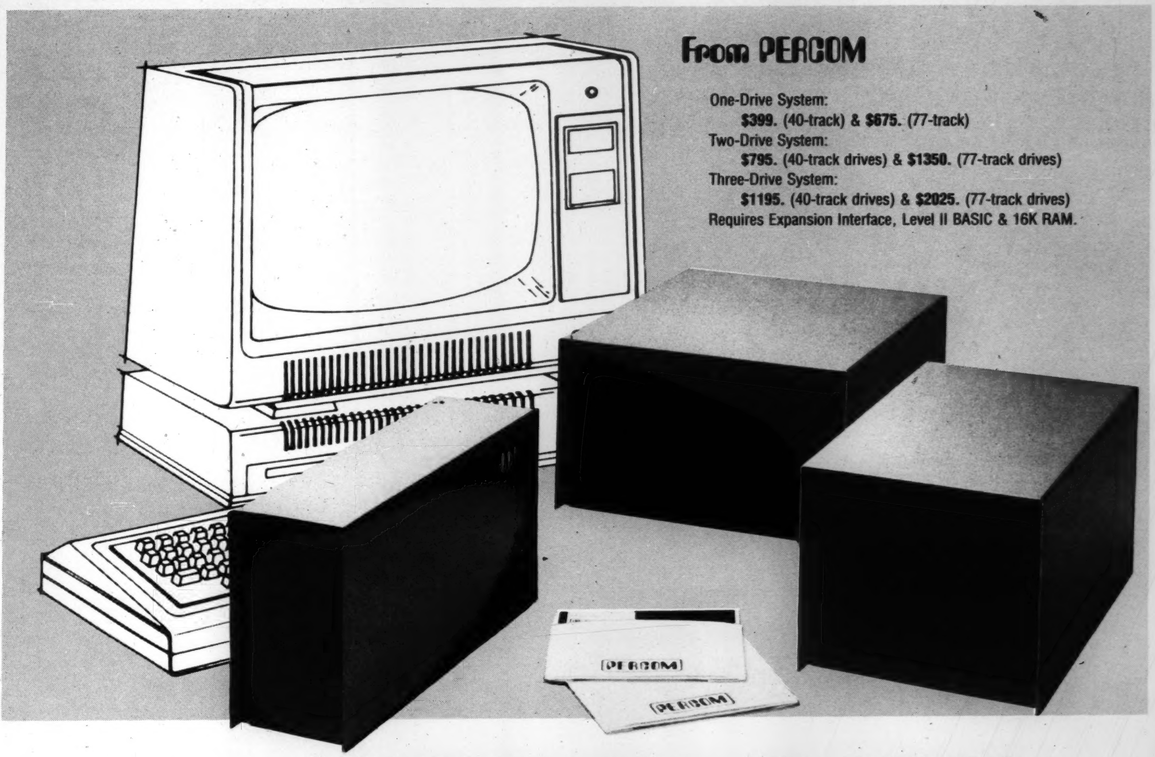

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